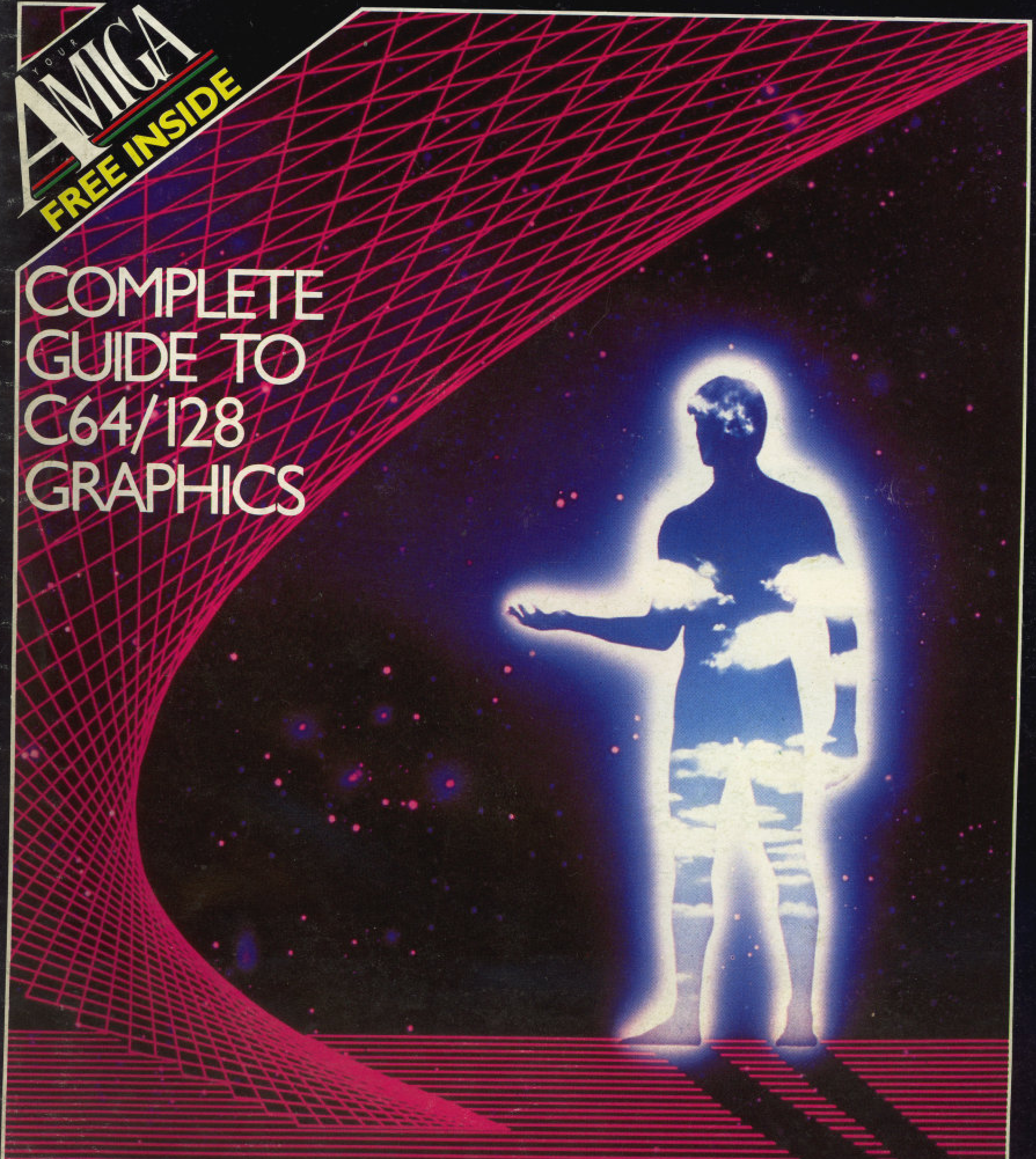
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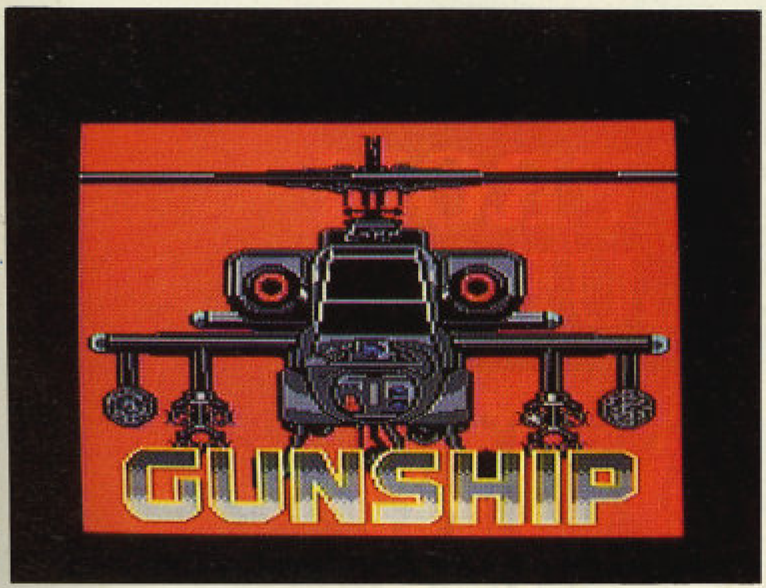


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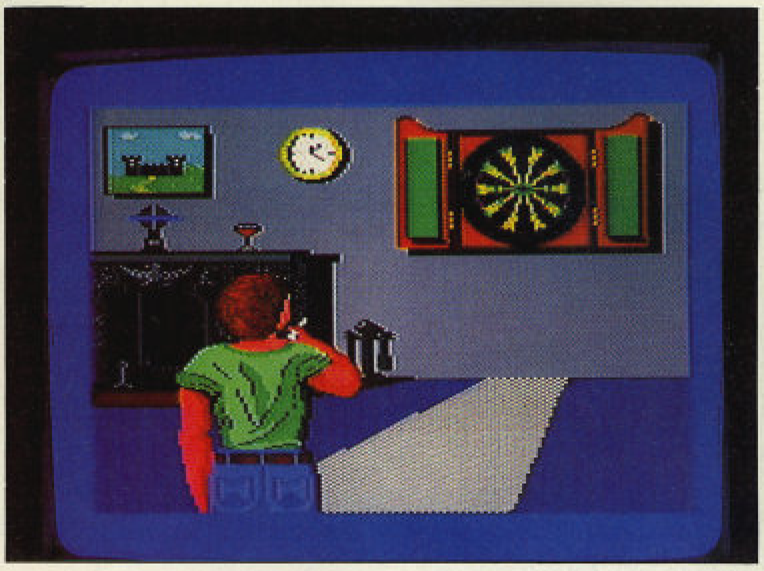
CONTENTS

VOLUME 3 NUMBER 7

FEATURES



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DATA STATEMENTS

Face Lift

Evesham Micros has come up with a face lift package for the C64 to make it look almost as good as the 64C.

The *Slimline 64* is a new case which can be fitted to old style 64s using a Philips type screwdriver.

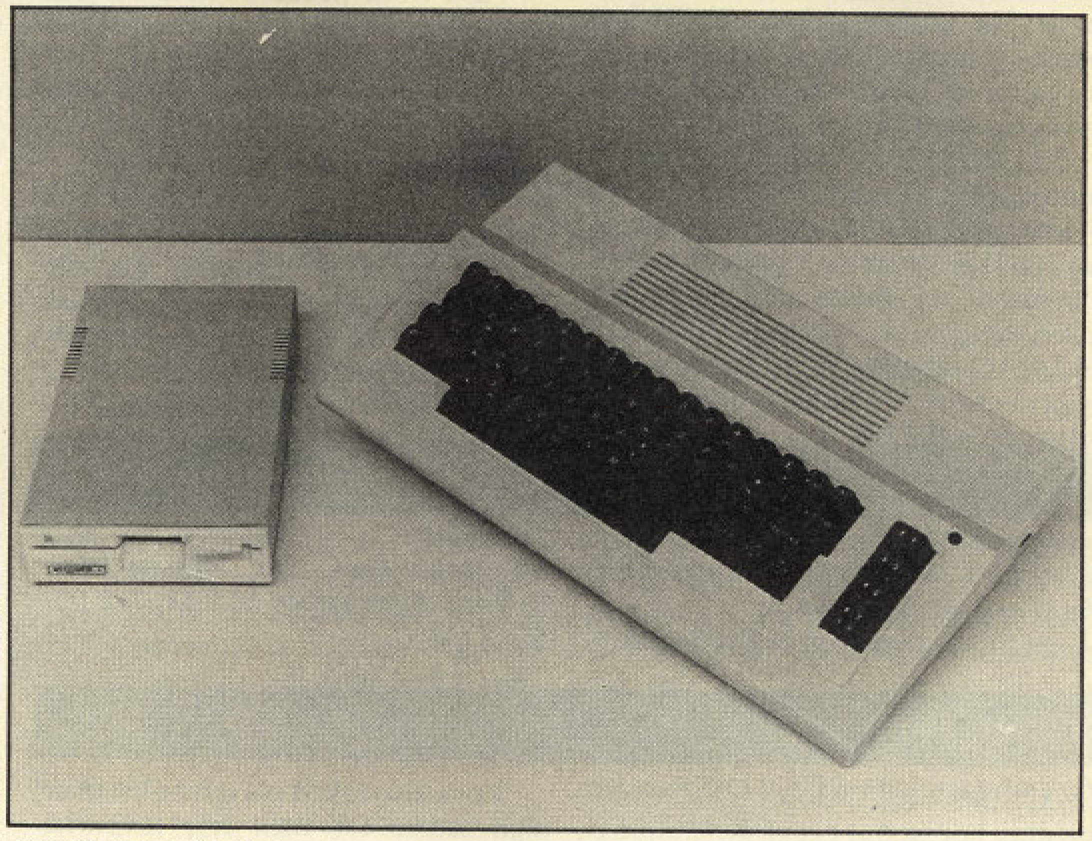
It's priced at £19.95.

Also to make your system look more up to date, and hopefully more efficient, is the *Accelerator* +, a new disk drive from Evesham for the Commodore range of computers.

Evesham has yet to discover a program which is not compatible with the new disk drive.

Features include the latest drive technology, an external power supply to avoid heat build up, a 25% increase in the standard loading speed and a full 12 month warranty. Priced at £159.95, you can also buy it packaged with *Freeze Frame Mark IV* for £179.95.

Touchline:
Evesham Micros: *63 Bridge Street, Evesham, Worcs WR11 4SF.* ***Tel:*** *0386 41989.*



Slimline 64 and Accelerator +

Budget Price

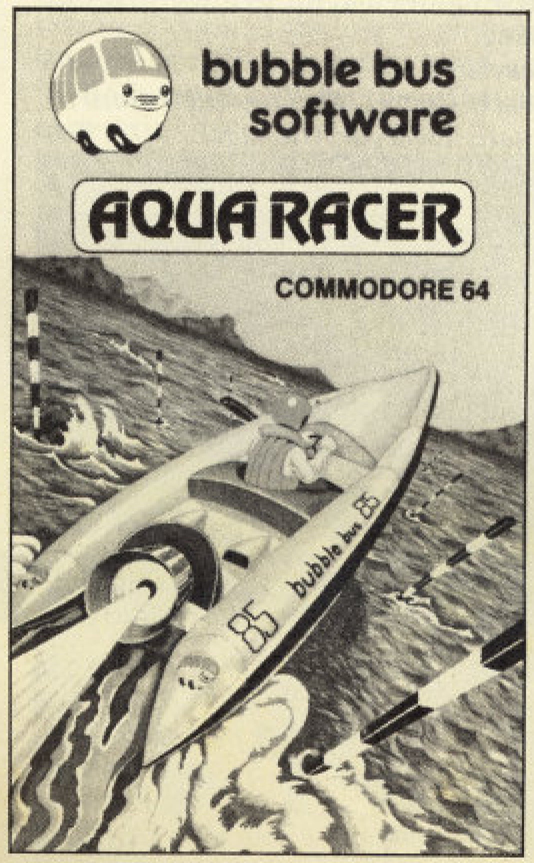
The first two games from The Power House are now available for the C64. They are *Terminator* and *The Equalizer*. Both of these games come with free House Music, which is apparently a new cult style recently imported from Chicago.

There is also another of CRL's popular C16 *Berks* titles which will be available at the same time. All priced at £1.99.

Bug Byte is relaunching an oldie Virgin game, *Strange Loop*. It's a huge arcade adventure featuring 250 rooms, window controls and game save. It will be priced at £2.99.

From Firebird Silver there are two new Commodore titles, both for the C64. *Olli and Lissa*, a game which has proved massively popular on Spectrum machines is now available for the C64. It is an arcade adventure in which you try and help a ghost called Humphrey save his ancient family home.

The second title is *Imagination*, a graphic/text adventure, which poses the simple problem of finding out the number of stars in the universe. Both are in the Silver range and therefore cost £1.99.



Bubble Bus has a new Mini Bus C64 game, previously a full price title, *Aqua Racer*. The game will be available at £1.99. In fact all £2.99 Mini Bus games have now been reduced to this lower price.

Finally, Codemasters is releasing two games for the C64 at £1.99 each. The two games are *Transmuter*, a sci/fi arcade game and *Super Robin Hood*.

Touchline
The Power House: *9 Kings Yard, Carpenters Road, London E15 2HD.* ***Tel:*** *01 985 6877.*
Bug Byte: *Victory House, Leicester Place, London WC2H 7NB.* ***Tel:*** *01 439 0666.*
Firebird: *First Floor, 64-67 New Oxford Street, London WC1A 1PS.* ***Tel:*** *01 379 6755.*
Codemasters: *1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX1 7RT.*
Bubble Bus: *87 High Street, Tonbridge, Kent TN9 1RX.* ***Tel:*** *0732 355962.*

DATA STATEMENTS

Golden Days

US Gold has recently announced the imminent release of a whole host of simulations from Strategic Simulations Inc. SSI is renowned for producing quality software with in-depth documentation and every wargame is researched to ensure gameplay accuracy.

The first release from SSI will be a compilation entitled *War Games Greats*. Included in the compilation are *Tigers in the Snow*, *Combat Leader*, *Knights of the Desert* and *Battle for Normandy*.

US Gold has also reached an agreement to handle Broderbund software in the UK.

The first UK releases from Broderbund will be *Printshop* accompanied by four graphics library disks and the *Printshop Companion Package* and *Toy Shop*.

At Easter there will be Broderbund compilation releases. The first is the *Loderunner Trilogy* and the second is entitled *Broderbundle* featuring *Raid on Bungeling Bay*, *Spelunker*, *Stealth*, and *Choplifter*. Both compilations will cost £9.99 (cassette) and £14.99 (disk).

Also from Broderbund there will be a new adventure called *Where in the World is Carmen Sandiego?*. There will also be a range of electronic novels, the first two of which are *Breakers* and *The Ancient art of War*.

Finally, US Gold is releasing a sports simulation entitled *Street Basketball*. This features all the hazards of playing games in a busy street, and you have to get your team to the top of the local league. Prices are £9.99 (cassette) and £14.99 (disk).

All the US Gold releases are for the C64/128.

Touchline
***US Gold:** Units 2/3 Holford Way, Holford, Birmingham B6 7AX. **Tel:** 021 356 3388.*

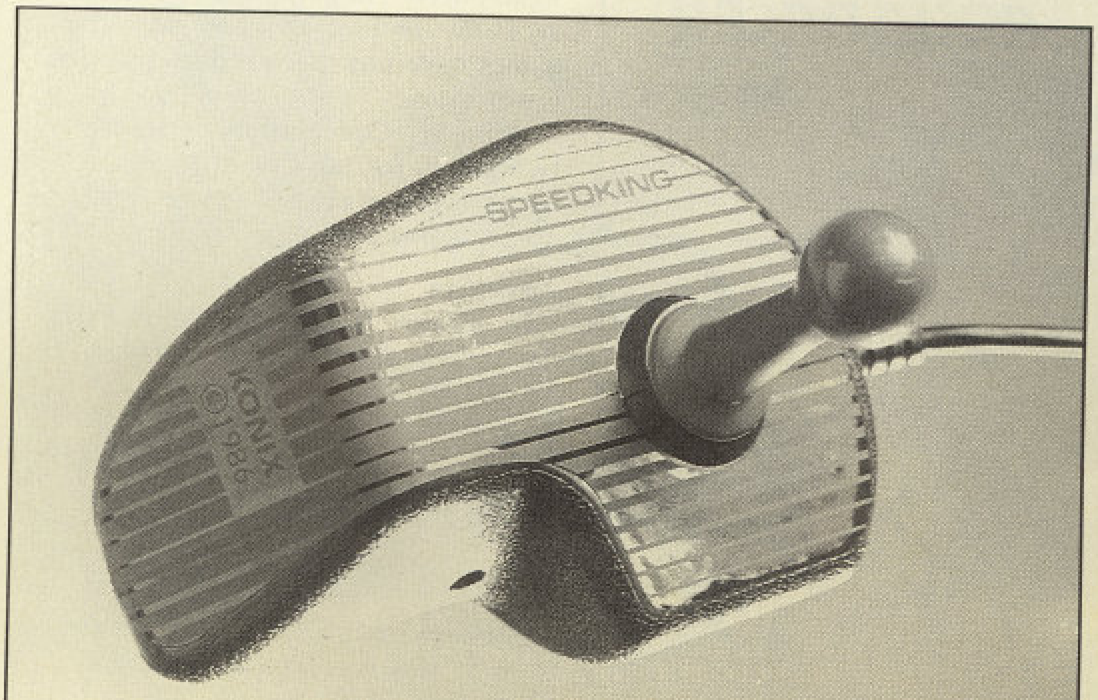
Players Poll

Epyx, the well known American software house, has begun distributing the Konix *Speed King* joystick in the USA.

Following extensive research which involved sending a questionairre and joystick to a random sample of avid American games players, they have concluded that you have an 84% chance of increasing your high score if you use the joystick.

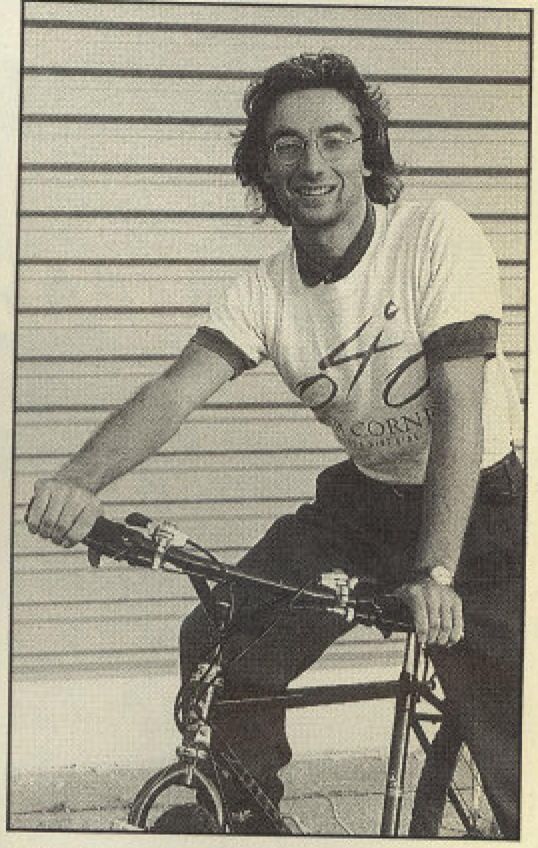
Epyx also asked players to list their high scores for their five favourite games (which included *Raid Over Moscow*, *Zaxxon* and *Pacman*) with and without the joystick. It is from these figures that the 84% increase was taken.

Touchline
***Konix:** Unit 13, Sirhowy Hill Industrial Estate, Tredegar, Gwent NP2 4QZ. **Tel:** 049525 5913.*



84% increase?

Micronet Marathon


Aidan Prior

On February 17 a team of youngsters set out on the largest bike marathon the world has ever seen. The Four Corners marathon aims to raise money for the charity Intermediate Technology which sets out to provide funds for long term development in the Third World.

One of the team, Aidan Prior (23) is being sponsored by *Micronet* and its members. Members of *Micronet* will be kept up to date with personal monthly bulletins from Aidan reporting on weather, food, publicity and, of course, his progress in the ride.

The ride commences in Hong Kong and will travel through China, Japan, Moscow, Finland, Sweden, Denmark, Germany and finally ending in Amsterdam having covered approximately 13,000 kilometres.

Micronet's Peter Probert said: "In the West, we tend to take technology for granted. *Micronet* is more than pleased to contribute towards a cause which will benefit the power communities around the world, and I am sure you will join us in wishing Aidan a safe journey".

Touchline
***Micronet 800:** 8 Herbal Bill, London EC1 5EJ. **Tel:** 01 278 3143.*

DATA STATEMENTS

Utilities

Database Software has recently released *Mini Office II* for the C64/128.

Mini Office II contains a database, spreadsheet, communications and graphics packages and a label printer.

Prices are £16.95 for cassette and £19.95 for disk and the package comes with a fully comprehensive 86 page manual.

CRL has launched itself into the graphics market with a new program entitled *The Image System*.

In addition to providing drawing and painting facilities, *The Image System* allows you to create your own text fonts. You can also zoom, move, copy, scale, rotate and fold your pictures. It is priced at £19.95 on cassette and £24.95 on disk.

First Analytical has followed up *GEOS* with three new application packages to operate in the *GEOS* environment.

Font Pack I provides 20 new fonts to further enhance printed output. *Desk Pack I* features two new desk accessories and two new applications. *Writer's Workshop* is a full function word processor. Further additions to the range are soon to be released. *GeoCalc* (a spreadsheet) and *Geofile* (database).

Prices are: *Font Pack I* – £23.50, *Desk Pack I* – £26.50 and *Writer's Workshop* – £37.50. All prices include postage and packing.

Touchline:

Database Software: *Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.* ***Tel:*** *061 429 8008.*

CRL: *CRL House, 9 Kings Yard, Carpenters Road, London E15 2HD.* ***Tel:*** *01 533 2918.*

First Analytical: *70 Borough High Street, London Bridge, London SE1 1XF.* ***Tel:*** *01 403 5493.*

Prestel Paper

Prestel is launching an exclusive on-line daily news service in conjunction with *The Observer* newspaper.

Reports will be compiled by an *Observer* editorial team who will receive exclusive stories through foreign correspondents as well as other news from the usual channels.

An overnight round up of UK news will appear on screen every morning. This will be followed throughout the day by headline stories as they break.

John Cornwell, communications publisher at *the Observer*, said: "The service will reflect the newspaper's traditional strength in providing perspective and explaining the significance behind fast moving events."

Prestel customers will be able to access the service direct on page number 3456 or through the on-line magazine, *Focus*. There will be no frame charges, only the standard *Prestel* time-based charge (6p per minute during business hours) and the cost of a local phone call.

Touchline

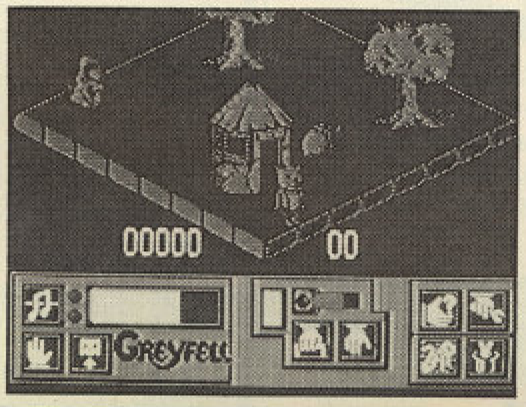
Prestel: *Prestel Headquarters, Telephone House, Temple Ave, London EC4Y OHL.* ***Tel:*** *01 822 1056.*

Detectives and Destroyers

Melbourne House is to release a detective adventure thriller entitled *The Mystery of Arkham Manor*. The chief character is a 1920s news-hound reporter who stumbles on dark secrets in the quiet village of Arkham. Solve the puzzle of the missing Colonel Fortescue.

Also from Melbourne House is *Doc the Destroyer*, a game about the first being in a new race of superheroes. The game combines adventure and arcade features, with puzzles which must be reasoned out and the use of physical strength in fight sequences.

Both are £9.95 for the C64 on cassette.



Greyfell

A new software house, Starlight, linked with Ariolasoft, has released *Greyfell – the Legend of Norman*. Greyfell is an alcoholic cat and with the help of his friend, the Wizard Hitormis, he must defeat the evil Mauron. *Greyfell* has just been released and it is £9.99 on cassette and £14.99 on disk.

The last new adventure this month is from Bubble Bus and is called *The Fifth Quadrant*. It tells the story of the exploring ship Orion mapping the Hercules Cluster. There is only one sector of the galaxy left to explore but this is where the trouble occurs.

Touchline

Starlight: *68 Long Acre, Covent Garden, London WC2E 9JH.* ***Tel:*** *01 836 3411.*

Melbourne House: *60 High Street, Hampton Wick, Kingston-upon-Thames, Surrey KT1 4DB.* ***Tel:*** *01 943 3911.*

Bubble House: *87 High Street, Tonbridge, Kent TN9 1RX.* ***Tel:*** *0732 355962.*

Software Success

Prospective professional programmers take note. Superior Software is once again campaigning for would-be programmers to come forward and, as an incentive to applicants, a free book will be given in exchange for details of programmer's abilities.

The new book is entitled *Success In Software* and contains sections on securing copyright, negotiating payments and bibliography of recommended books.

It has been written by Richard Hanson, boss of Superior Software, who started life as a programmer himself and set up his company with a mere £100.

Hanson commented: "Some of my advice is common sense but I have tried to help people avoid the pitfalls that can happen. I have five year's experience specifically in the computer games industry and the book is intended to be of help to artists, musicians and ideas men as well as programmers."

Touchline

Superior Software: *Regent House, Skinner Lane, Leeds LS7 1AX.* ***Tel:*** *0532 459453.*

D A T A   S T A T E M E N T S

Famous Names

As always there are a few games on the way which feature some very well known names.

This first is inevitably from Domark. The company has gained the rights to produce three Star Wars games; *Star Wars, The Empire Strikes Back* and *Return of the Jedi*. Versions for the C64 are planned, however, programming will not commence until later this year and the games are scheduled for a late 1987 release.

Followers of 2000 AD, the cult comic, will be familiar with the character Nemesis the Warlock who leads the resistance movement against Torquemada, Grand Master of the Terminators. Now Nemesis will feature in a game for the C64 from Martech. Availability and price are undecided as yet.





Going back a few years to old black and white movies, how about a Laurel and Hardy game. This will be the latest offering from Advance Software Promotions. It will be a one or two player game and Advance has spent about eight months negotiating the European rights to the characters.

The game will be released throughout Europe allowing for regional variations. For instance in Scandinavia the names will be changed to Big and Little Reindeer and in Spain to Fat and Thin.

Touchline

Domark: *Domark House, 22 Hartfield Road, Wimbledon, London SW19 3TA.* ***Tel:*** *01 947 5622.*

Martech: *Martech House, Bay Terrace, Pevensey Bay, East Sussex BN24 6EE.* ***Tel:*** *0323 768456.*

Advance: *17 Staple Tye, Harlow, Essex CM18 7LX.* ***Tel:*** *0279 412441.*

Gunship

Flight simulators are usually a minority interest field in the games world. Gunship should change all this.

By Tony Hetherington

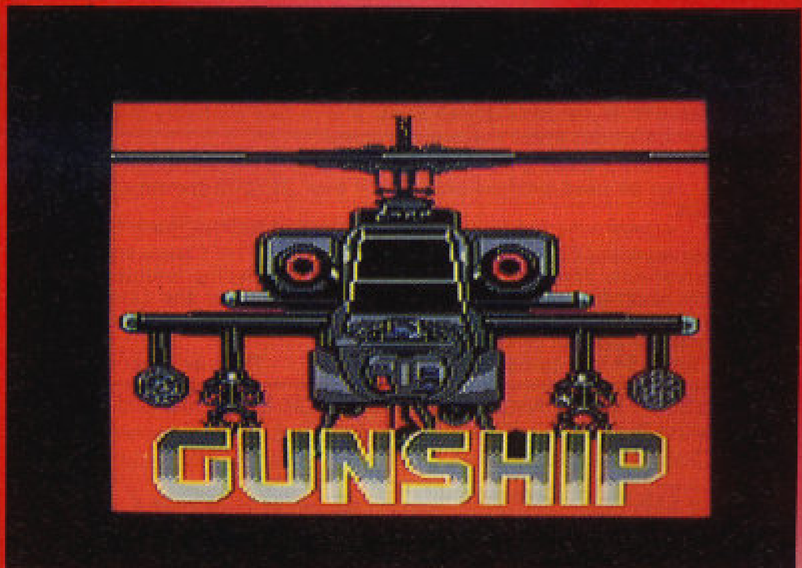
Discover the danger, excitement and agony of "real" combat flying as you take to the skies in an Apache AH-64A helicopter gunship. Armed with cannons, rockets and laser guided missiles and protected by computer controlled radar and electronic jammers you must fly dangerous missions from the training fields of the USA to the battlefields of South East Asia, Central America, the Middle East and Western Europe.

Your career in the US Airforce begins as a Sergeant on the training fields and can end either as a retiring Colonel heaped in decorations and battle honours or in a battered heap of a shot down wreck.

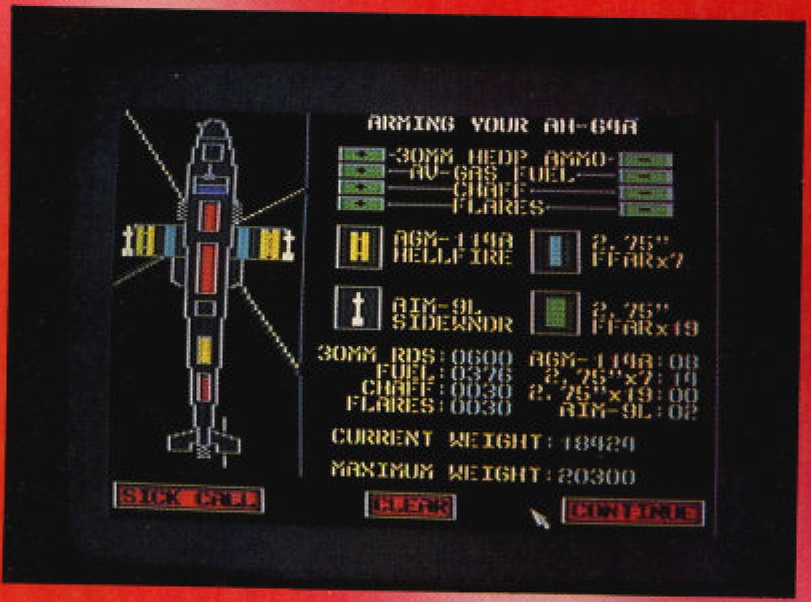
Flying the Apache is actually easier than other simulators as the 31 keyboard and joystick controls are easy to learn thanks to two flying tutorials and a keyboard overlay. Basically all you have to do is control the power that you send to the rotablades and then move the joystick forwards and backwards to control the height and speed of the helicopter. Unfortunately, this becomes a lot harder when there are mountains to be avoided and enemy tanks, helicopters and gun emplacements trying to shoot you down. The result is that the "very low" risk training flights actually turn into suicide missions. However it won't be long before you're loading up your weapons for a mission against a real enemy.

Before you embark on a mission (and your first posting is likely to be in South East Asia) you should read the briefing and intelligence reports to learn of your targets and enemy strengths and study the map to plan your route. If you don't like what you see then you can opt out by going on sick call





GAME OF THE MONTH



but since this is frowned on, could jeopardise a promotion and even get you posted to an even tougher assignment it might be better to chose your weapons and get on with the mission.

Your weapon load can be made up of any combination of 30mm cannon amo, rockets, and missiles that can fit on your Apache and depends on the enemy you're about to face. If you're expecting any enemy Hind helicopters then stock up with sidewinders "fire and forget" missiles, Hellfire air to ground missiles are easy to target and can wreck any tank or bunker or if it's mainly infantry and guns then take lost of cannon shells and Ffar rockets.

The screen display shows your 3D view out of the front (or left or right) cockpit windows as well as a bank of system warning lights, standard flight controls, threat display that plots the approach of enemy helicopters and missiles and a central VDU that is used as a mini map display, message screen and part of the TADS (Target Acquisition and Designation System) weapons system. Whenever TADS picks up a target a vector graphic of it appears on the VDU and a square cursor is superimposed on the cockpit window. It's up to you to decide which weapon to fire and guide it to its target. Beware this highly sophisticated system locks on to any target inlcuding your own tanks, bases and infantry so you must thing before you fire or you'll annoy the C.O. and blow the promotion.

Gunship is a massive game including over 100 missions ranging from interdictive strikes on enemy headquarters, fuel depots and heli-bases to ground support missions through to "clearing" jobs where you wipe out anything that moves to create a safe landing zone. On your return you'll be judged on your success, awarded victory points and perhaps a medal or even a promotion. It's this promise of success and glory that will drive you back again to try just one more mission.

Touchline
Title: *Gunship.* ***Supplier:*** *Microprose, 2 Market Place, Tetbury, Gloucester GL8 8DA.* ***Tel:*** *0666 54326.* ***Machine:*** *C64.* ***Price:*** *£14.95 tape, £19.95 disk.*
Originality: *8/10.* ***Graphics:*** *8/10.* ***Playability:*** *10/10.* ***Value:*** *10/10.*

YC

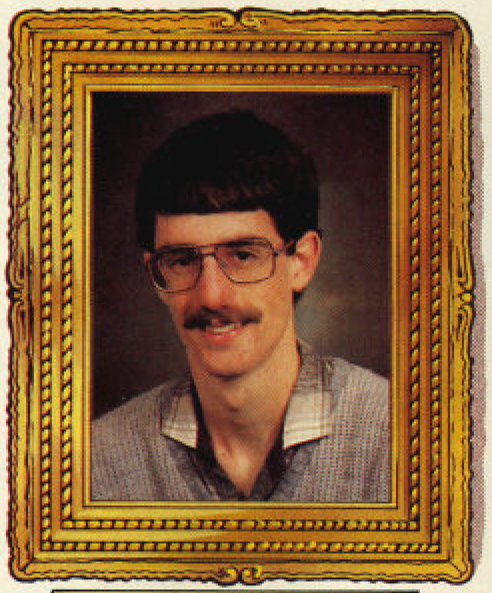
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Tim Tyler Programmer of the Year 1986

Royalty Payments to Date £41217.15



Peter Johnson Programmer of the Year 1985

Royalty Payments to Date £36593.46

BBC Micro Software Top 10 January 12th 1987

1. Repton 3 .... Superior Software
2. Ravenskull .... Superior Software
3. Stryker's Run .... Superior Software
4. Micropower Magic .... Micropower
5. Computer Hits 3 .... Beau Jolly
6. Winter Olympics .... Tynesoft
7. Sentinel .... Firebird
8. Commonwealth Games .... Tynesoft
9. Karate Combat .... Superior Software
10. Trivial Pursuit .... Domark

Compiled by Gallup Chart Services (Reproduced by kind permission of Gallup)

Superior Software Ltd is unquestionably the leading software house for the BBC Micro and Electron — with chart-topping programs such as *Repton, Thrust, Stryker's Run, Citadel, Ravenskull* and *SPEECH!* In addition, *Repton 3* and *SPEECH!* have also been successful releases for the Commodore and Amstrad computers.

Our authors have been successful too. Tim Tyler, a 17-year-old from Exeter, has so far earnt £41217.15 in royalties from sales of his *Repton* games; and Peter Johnson, the author of *Overdrive* and *Deathstar*, has now received £36593.46.

As part of our program of continued expansion, we are looking for top-class programmers of **all** home computers, including: Spectrum, Commodore 64/128, Amstrad 464/664/6128, Commodore 16/+4, Atari ST, Amstrad 1512 PC, Commodore Amiga, BBC Micro and Electron. We are also eager to contact games designers, graphics designers, and composers of computer music.

We have a string of major releases planned for 1987 including the new games: *By Fair Means Or Foul, Nautilus* and *Haunted House;* we require conversions of these games to be written for **all** major home computers.

If you would like to be part of our continuing success story, please tell us about yourself by filling in the coupon below and sending it to us. We will immediately send you a **free** copy of our booklet "Success in Software" which is packed with hints, tips and advice for computer programmers. Alternatively, Superior's Managing Director Richard Hanson is always available to speak to accomplished programmers; you can phone him on 0532 459453.

WHY SHOULD YOU CHOOSE SUPERIOR SOFTWARE TO PUBLISH YOUR PROGRAMS?

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Our authors are usually paid on a royalty basis, receiving 80p for every cassette or disc sold. The royalties are calculated and sent out promptly every three months. For exceptional programs, we will also consider making a downpayment on the royalties or an outright cash payment.
"I went with Superior Software because I knew that their Managing Director, Richard Hanson had already achieved some acclaim as a games programmer himself. When they published my game Overdrive it was a great success, and I've now earnt far more money from that program than from any of the other 16 programs which I've had published." . . . Peter Johnson, author of Overdrive and Deathstar.

We always give individual attention to our programmers and their work.
"When I approached Superior Software with an early version of Ravenskull, I received a great deal of help and advice on how to improve the game. I can quite definitely say that their prompt and decisive service transformed a mediocre game into a high quality arcade-adventure which subsequently topped the BBC and Electron charts." . . . Martin Edmondson, co-author of Ravenskull.

Superior Software has built up a reputation for honest dealing and dependability. We are one of the few software houses that have been in business since the start of the home computer software boom in 1982.
"I've worked for other software companies and regrettably I have to say that I feel I've been ripped off on most programs I've written. Last year I showed Superior Software my Sinbad game, and they made me an offer which was more than double the highest offers I'd been given elsewhere." . . . Jason Benham, author of The Legend of Sinbad.

Being a medium-sized software house has its advantages for our programmers. We are large enough that we can afford to launch new software with expensive advertising campaigns and all the necessary razzamatazz. However, we are not so large that your program will get lost among a mass of new releases.
"I used to work for another software house, and I never got to speak to any of the directors nor anyone with any major influence within the company. At Superior Software, I deal directly with the Managing Director. Perhaps more importantly, just 6 weeks after the release of Stryker's Run I received my first royalty cheque which amounted to more than £5000. Whereas obtaining my royalties due from the other company was like getting blood out of a stone; it took several months of nagging and chasing before they paid me the money they owed me." . . . Chris Roberts, author of Stryker's Run.

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Name ....

Address ....

Phone .... Date-of-Birth ....

Major Programs Written or Under Development

Title	Computer	Publishing Company

Computers Owned (or accessible) (Please tick appropriate boxes)

Spectrum ☐ Amstrad 1512 PC ☐
Commodore 64/128 ☐ Atari ST ☐
Commodore 16/+4 ☐ BBC Micro ☐
Commodore Amiga ☐ Electron ☐
Amstrad 464/664/6128 ☐ Other (please specify) ☐

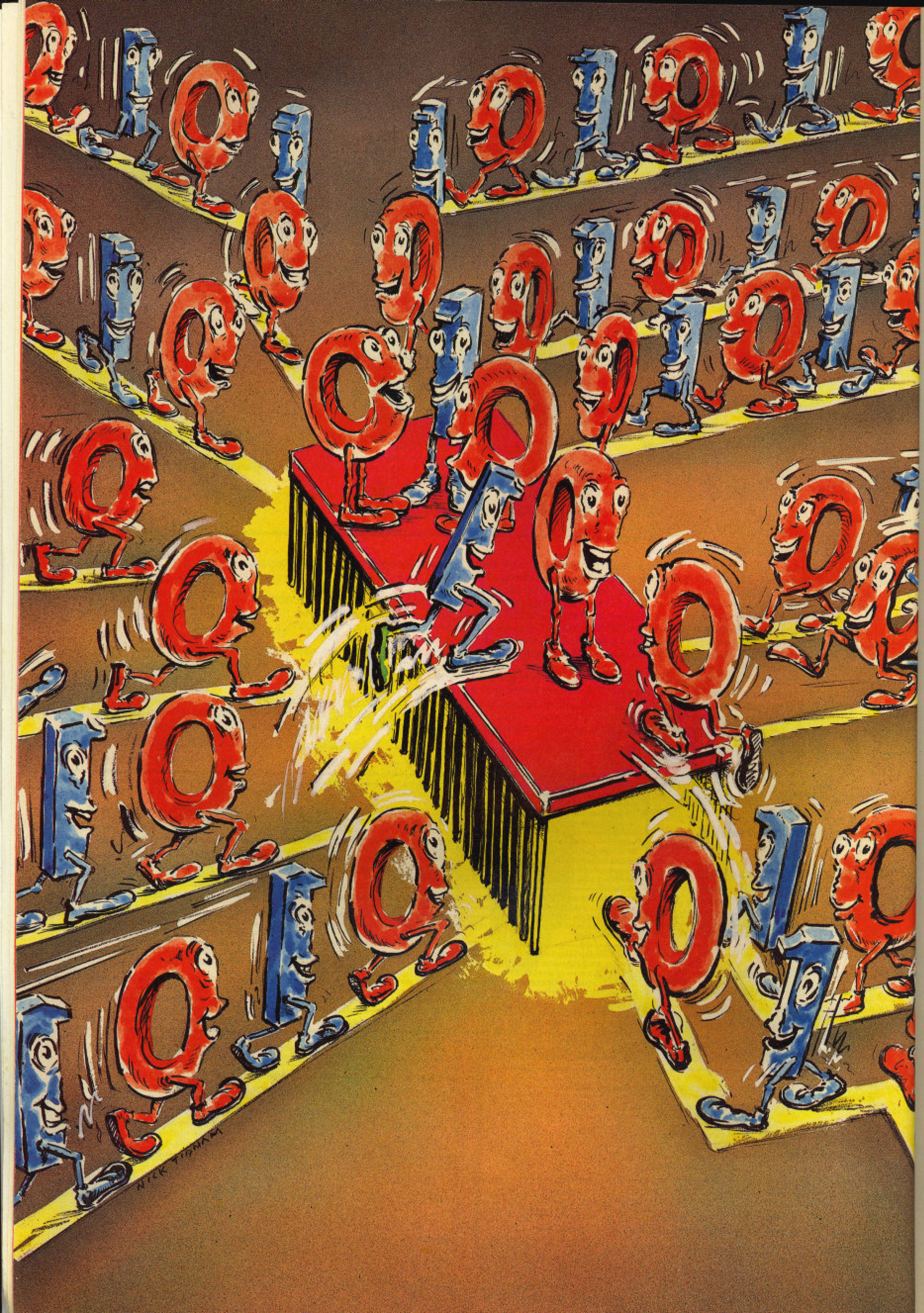
Interests (Please tick appropriate boxes)

Arcade Games ☐ Designing Graphics/Loading Screens ☐
Strategic Games ☐ Composing computer music ☐
Utilities ☐ Other (please specify) ☐
Business Programs ☐
Designing Games ☐

Any other relevant information

SUPERIOR SOFTWARE Limited

Dept. RC2, Regent House, Skinner Lane, Leeds LS7 1AX. Telephone: 0532 459453.


NICK TIDNAM

Byting into the 6510

Want to overcome the limitations of Basic? Speed things up on your C64/128? This first article in a series is your entry into the world of machine code programming

By Burghard-Henry Lehmann

Have you ever wondered, how some programs are able to use graphics with the speed of film-animation?While, if you try your hand at high-resolution graphics, it takes ages for the screen to clear, let alone, something exciting to happen.

This is because you are attempting to do the job in Basic which is very slow in execution.

Why? Because the Basic program is interpreted, that is, the Basic interpreter, which resides in ROM and is nothing more than a very large machine code program, looks at each Basic instruction separately. Even a simple Basic command like "POKE" hides a routine in ROM which is as long as your arm. And it has to do all this every time it comes up against the "POKE" command, as if it never heard of "POKE" before. No wonder that Basic is slow!

The 6510 chip in your Commodore 64 is the real computer. Everything else, like the ROM and RAM chips and the keyboard, are peripherals. The 6510 does all the donkey work, even if a program in Basic is being run. Why communicate through the Basic interpreter when you can communicate directly with the microprocessor, which executes your instructions immediately?

But how do you talk to the microprocessor?

The Hard Way

This is so simple, that it may be difficult for the novice to grasp. You use machine code, a code consisting entirely of "numbers", and the tiny microprocessor chip, which contains a program all on its own, takes those "numbers" as instructions and executes them.

But, you say, this computing by numbers business is not very convenient for us fallible human beings. We have to look up every instruction we want to give to the microprocessor, in order to find the right "number", and if we get the number wrong – the microprocessor may do something completely different. And that may mean curtains for your program – the machine may crash.

Contrary to popular belief, machine code programmers too are human beings. So they use a compromise between those dreadful, boring numbers and the long, drawn-out instructions used in a high-level language like Basic.

This halfway-house is called "assembly language".

The Solution

Assembly language consists of a very small number of simple mnemonics like "LOA", "STA", "BRK", which are written in numbered lines, very much as in a Basic program. These are then translated into machine code with the help of a program, called an "assembler". The assembler simply looks up the instruction – let's say "LDA" – and finds the proper machine code for "LOA", for instance decimal 169. Then it writes the code into memory, and, when you run the program, the microprocessor finds it and executes it instantly.

These days most machine code programmers are really assembly programmers. Only in the ancient days of computers (some 15 years ago), were there extraordinary human beings, who spent their time, making up long lists of binary numbers and then painstakingly feeding them into the computer – not even via a keyboard, but by tossing a series of switches, each representing a binary bit.

Today we've got keyboards and assembler programs. You possess the keyboard already, if you haven't got an assembler yet, you should get yourself one, because in this series of articles you will learn how to write machine code programs in assembly language.

Task 1

Instead of adding more theory, I'd like to start the ball rolling by considering straight away a practical programming task.

We want to print the character A on to the screen and we want to do it entirely in machine code.

In all likelihood, you already know that on the C64 you can poke characters directly on to the screen. On page 132-134 of your manual you'll find a list of characters and the value which you have to use for each character to get it on to the screen.

Listing 1

```
10        ORG 49152
20        LDA # 1
30        STA 1024
40        RTS
```

But what does it really mean, to "poke" a character on to the screen?

There is an area reserved in memory (normally starting from decimal 1024), which is "wired" to the screen output in such a way, that everything contained in these locations is echoed on to the screen. If you put a 1 into location 1024, you'll get an A printed on the left top corner of the screen.

If your C64 still contains the old ROM, you might not see the A, because it is printed with the paper-colour as ink-colour. But it is there, as you can prove by homing the cursor to the top left corner.

You may know all this already. But there is, buried underneath it, a very important point for our general understanding of the workings of the microprocessor.

Input – Processing – Output

What I have described above is also called "output", and the important thing to realise here, is that you can make things happen by writing data to certain locations either inside the computer, as in the above example, or outside the computer,as you would do, when you save something on to disk or channel output to the printer.

Basic programmers forget this fact of life, because its all done for them. As a prospective machine code programmer you have to become aware of it, which means in practice, you have to know, where things are in the computer.

No, you do not have to become involved in chip technology. You merely have to know such things, as that the screen memory starts at 1024, the colour memory starts at 55296, SID's registers start at 54272 etc. And, for people like myself, who do not believe in filling their heads with numbers, it means that you have to know, from which book or magazine you can get that information. If you don't let yourself be intimidated by the technical jargon, it's as easy as knowing that Bognor Regis lies on the south coast of England and not somewhere in the South of France (I've looked that up too!).

Now enter the 6510 microprocessor, the real computer, which does all the work.

All the 6510 ever does can be described in one sentence. It gets a byte from somewhere in the computer, does something with it, and puts the result back, either where it came from or somewhere else in the computer.

This very simple sequence we can describe as: "INPUT – PROCESSING – OUTPUT".

How can we now get the microprocessor to write, a 1 (which stands for the letter A) to location 1024?

Entering the 6510

First, you have to know, that the microprocessor has locations all of its own. These locations are quite special, compared to the run-of-the-mill locations in the rest of the computer. They are called "registers" and are not used for long-term storage, but act instead as a sort of gateway through which all the data which the microprocessor must process, is syphoned.

A useful comparison here is the human heart which acts as a pump, sucking blood into its chambers and pushing it out again, so that it will circulate all round the body.

The microprocessor, which is truly the heart of the computer system, functions in a very similar way. Bytes of data are moved into its chambers ("registers") – "INPUT" – and are then moved out again – "OUTPUT" – and that's precisely what makes the computer tick.

But, to expand on our comparison, the microprocessor is not only the heart of the system, but also its liver. Because it does not only make the data go round, it also processes it at the

Listing 2

```
10                          ORG 49152
20   49152   169   1        LDA # 1
30   49154   141   0   4    STA 1024
40   49157   96             RTS
```

same time, as the human liver purifies the blood.

The Accumulator

The most important register of the 6510 is the A-register or the "accumulator". In a way, that's the liver. As its name suggests, the accumulator is used, to add and substract numbers.

Then there are the X- and Y-register, which are called the "index-registers", because they are mainly used as pointers to mark out a table of locations.

These three registers are the most important ones of the 6510, as far as the programmer is concerned. There are some others, which are also quite important to him, and then there are some more, which are only important to the internal workings of the processor and over which the programmer has no influence at all.

We will deal with all this more thoroughly in due time, now let's return to our programming task.

Inputting a Byte

Listing 1 gives you the assembly listing which, when assembled, will perform the task we have set ourselves.

This is also called the "source file". The machine code, which the assembler produces, is called the "object code". Once you have your object code, you may in theory dispose of the source file, because the microprocessor has no need for it. But in practice you are wise to keep it for future reference.

Now let's look a bit closer at the source file in listing 1, ignoring the first line for the time being, and going straight for the "action", starting from line 20.

LDA is one of those assembly language mnemonics, which we have already mentioned. It stands for "Load the Accumulator with".

The meaning of this should by now be quite clear. We are instructing the microprocessor to load (INPUT) a byte of data into its A-register, or, to stick with our allegory, we are getting the heart-pump to suck some blood into its main chamber.

The instruction LDA is also called an "op-code", which is short for operational code, because this is the instruction itself.

Useful as this instruction is, on its own it would be quite useless to the microprocessor without the information given after it – in our case " # 1" is the data, or the blood itself, which we want the microprocessor to circulate. It is called the "operand", and in our little program we are giving the operand directly to the microprocessor, that is, the data, we want to process is contained in the instruction. This is called immediate addressing.

On other occasions we tell the microprocessor, rather rudely "Get it Yourself!", and then we need to tell it, from which location it can get it. This means, that the operand contains now the address of a location and not a data byte.

Generally, this is called "absolute addressing", but there are different ways in which we can point the microprocessor at the location we want. More about this very important subject later.

In assembly language we use in both cases the instruction LDA, but the machine code or object code, into which the assembler will translate the instruction, will be different, because the microprocessor has to know that what follows is either a byte of data or a location. To make it quite clear to the assembler, what assembly we want, we prefix a data byte with the " # " sign and leave the address of a location without a prefix. This is a convention which you'll find in all assembly listings or source files

Outputting a Byte

In the next line of our little program (line 30), we do the exact opposite of what we did in the first line. We instruct the 6510 to output a byte of data to location 1024 in the computer, which is of course the beginning of screen memory. That is, to get the heart of our computer system to pump blood into the veins.

STA stands for :"Store the contents of the A-register in".

In this case the operand can of course be nothing but a location, even though,as we will see later, there are again different ways in which we can express the location.

Lines 20 and 30 form the action part of our little machine code program. This is all it needs, to perform our task, to get the microprocessor to fetch the screen code 1, which stands for the letter A, put it into its A-register (INPUT) and move it from there to its destination (OUTPUT).

In this case we didn't do any processing inside the 6510. All we did was a simple IN/OUT process, but if you have grasped this, you'll have already begun to understand how things are made to happen in a practical way in microprocessor-land.

Assembly Language versus Basic

But you may muse at this moment: "Is this assembly language lark not even more long-winded than the simple Basic command, 'POKE 1024,1'? After all, it takes two lines for one lousy Basic instruction!".

On the surface it looks like this. But those two lines of source code are translated by the assembler into only five bytes of object code, and those five bytes the microprocessor executes immediately, and there is nothing more. In Basic, as we have already said, it has to go all around the house, in order to do the thing: First, it has to interpret the command POKE itself, then it has to translate "1024" from the ASCII-string, in which it appears on the screen, into a more useful low-byte/high-byte sequence. Then it has to process the comma, which acts as a deliminator, and then it has to do the same thing with the 1 afterwards. Only then is it ready to do at last, what we did in our program!

You might find this confusing, when starting to program in assembly language. Assembly listings have a habit of growing very quickly! And you'll think to yourself. "This will take ages to do!". Don't let yourself be fooled! Except if you write outrageously badly organized machine code, it will do it in the wink of an eye.

The Program Counter

Let's now look at what the first line of our program is all about.

In order to supply the microprocessor with instructions to keep it busy. It would be highly impractical to feed it each instruction separately. For a start, the 6510 is able to process about half a million instructions in one second.

Instead we write a series of such machine code instructions into a certain area of the computer memory, tell the microprocessor, where those

instructions start, and then leave it to get on with it.

For this purpose the 6510 chip has a very important register, called the program counter. This is the only register of the 6510 which can hold a 16-bit number, that is a number in the range of zero to 65535. All the other registers can only hold eight numbers, and that means numbers in the range of zero to 255.

The reason, why the program counter has to be 16-bit is that it holds the location on which the microprocessor is working at any given moment, and since the C64 contains 64k or 65535 locations, the program counter has to be able to address all of them.

This is what happens, when the microprocessor executes a machine code program.

First, the start location of the program is loaded into the program counter (in our example: 49152, which is the beginning of user-RAM). Then the microprocessor gets the byte which is contained in this location and loads it into one of those special registers over which the programmer has no influence whatsoever – the instruction register. This is to allow it to find out in advance, what to do with the next byte. Will it be a data-byte or the address of a location, where data has to be fetched from? Is that location in zero-page (locations zero to 255 in the computer, which need only the low-byte to specify them) or will it be an absolute address, which needs a low byte and a high byte? Or might this particular instruction have no operand after it at all (implied addressing), so that the next byte will be another instruction?

Now the microprocessor bumps the program counter up by one and gets the next byte, with which, at this point, it already knows what to do. If it is a data byte, it goes into the data register – another one of those secret registers – if it is the address of a location, it goes into the "address register".

If the address is absolute or 16-bit, the 6510 repeats the above procedure (including incrementing the program counter) one more time in order to get the high byte too.

Now it is ready to execute the whole instruction, while the program counter is already pointing at the beginning of the next instruction.

Initiating

There are two important morals in this story. Firstly, you have to tell the microprocessor where to start executing, and secondly, you have to tell it where to end.

If you don't give it the right start location, it will begin to execute from that location, all right, but it will interpret the first byte it finds as an instruction, even if it is a data-byte, because this is way, the microprocessor is programmed!

And if you neglect to tell the microprocessor where to stop executing, it will just go on executing ad infinitum. In the end your only remedy might be, to unplug the machine, because the microprocessor will be so busy executing all this nonsense that it will not be able to react to the keyboard. That means that the machine is out of your control.

Pseudo-Instructions

In line 10 of our program we set the address (49152) where we want our program to start. We do this with what is called a pseudo-instruction or assembler-instruction.

"ORG" (short for "origin") is not part of assembly language because we are not giving an instruction which is to be assembled into machine code. Instead we are merely telling the assembler to write the following code to an area of memory starting with location 49152.

After we have assembled our source file (and have saved it on to tape or disk, we can run it by giving the Basic instruction SYS 49152.

Now the operating system of the C64 saves certain important variables, needed for later, puts the start location 49152 into the program counter of trhe 6510 and tells it "Go!".

The microprocessor now executes your program, while the operating system rests. From this points onwards the machine is at your fingertips, to do with it as you please! In a way, it's not really the Commodore 64 as you know it any more. It's 64k of RAM completely at your mercy! It's you and the naked machine. Endless computing possibilities are opening up to you – some you haven't even dreamt about, and all executed at maximum speed!

But, beware. Machine code also means, no error checking! If you get things wrong, the machine won't explode, but it might crash! And this, while not lethal, can be mighty frustrating!

Stopping the 6510

All good things come to an end, as my grandmother, who had a thing against platitudes, never told me. Sooner or later you'll have to return into the safe haven of the operating system, unless you have by then designed your own operating system.

This is what the last line of our program is all about. It contains a RTS instruction and that is short for "Return from Subroutine". It's very similar to the Basic RETURN command.

Why return from subroutine?

The operating system treats all user-designed machine code routines as a subroutine. And before it calls that subroutine, it saves the address, to where the microprocessor has to return afterwards, in a special area of memory called the machine stack. We will deal with the intricacies of the machine stack later. Here it is enough to say that the machine stack is a sort of office spike which the microprocessor uses for all sorts of safekeeping purposes. The return-address is simply pushed on to the stack, and when the processor gets an RTS instruction, it pops the topmost address from the stack, loads it into the program counter and continues execution as from this address.

In our program example "RTS" means of course, that it gets an address within the operating system, so that it can continue executing again from within the operating system.

We have successfully returned to Basic.

Listing 2 is an assembler listing of the source file in listing 1. Next to each line number you find the address of the current location, where the assembler has written the object code, and then the object code itself. If you study this listing thoroughly you'll find it a useful illustration to what I have explained and especially in the section on the workings of the program counter.

In the next article we will expand on our programming theme and learn how to create a loop in machine code. YC

Games Reviews

The appeal of arcade games never seems to pall, so we keep you up to date with what's on the shelves in your local software emporium.

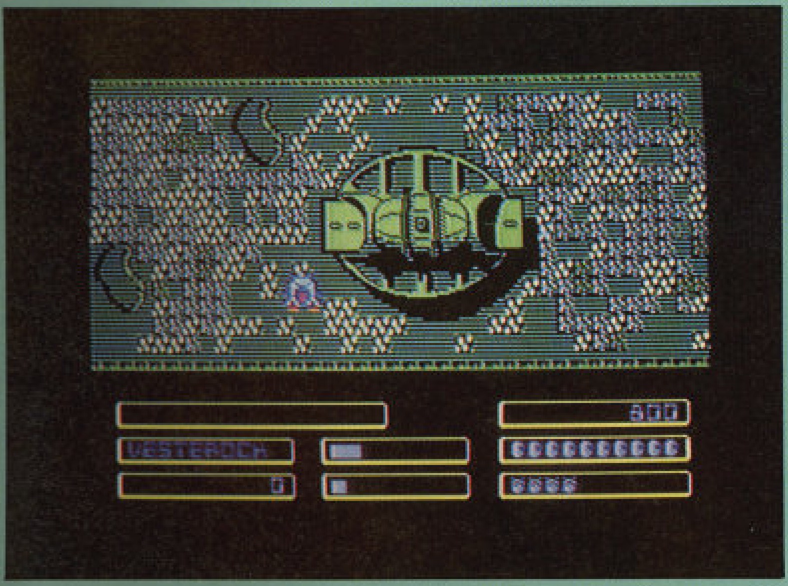
AGENT ORANGE

Ever fancied trying your hand at farming or, even better, intergalactic farming? You now have a chance to find out how green your fingers actually are. *Agent Orange* is a new game from A'n'F which is a shoot 'em up with a difference.

You play the role of a flying farmer working for the Intergalactic Agricultural Research Establishment (IARE for short). The aim is to battle with the aliens and cultivate eight planets to find a super weedkiller (yes, you've guessed, it's codenamed *Agent Orange*). Succeed in this mission and you'll become a hero among the farmers galaxy-wide.

You start the game with one mothership and eight daughter vessels (I don't know where daddy got to). You can then head off towards the first planet armed with seed pods and bullets.

You don't have to dig holes to plant your seeds, space farmers are a bit more advanced than that. You simply have to fly over the ground and drop the seed pods which will miraculously grow and ripen before your very eyes. Unfortunately you are not the only one using the soil, there is competition from the aliens and their seeds and from the dreaded weeds (yes, they even get their roots in up there). Alien seeds seem to grow far quicker than earthly ones but fortunately you can burn these down by firing at them.



Once the seeds you have planted turn red you can collect them but they should be left a while to multiply which will increase your crop. Unfortunately there's nothing you can do about the natural weedy vegetation so you have to plant your seeds quickly before all the room is filled up. After you've grown all you can, collect your produce and head for home.

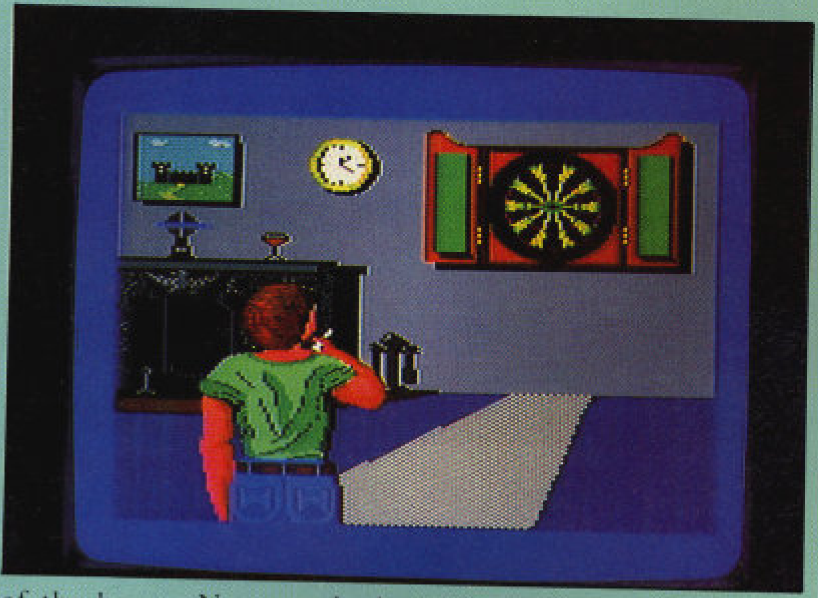
If you have made a reasonable profit you can trade your old ship in for a bigger, faster one. This will obviously be an advantage for reaching your destination quicker and you will also fit more crops in the hold.

This game is an improvement on the general shoot 'em up games in that there is a purpose in what you are doing. It isn't just a matter of shooting at aliens until they are all gone, but you are firing at them to gain access to the next planet, and ultimately to the weedkiller. The graphics are reasonably good but the sound is a bit lacking. All in all though, the game is entertaining and good value for money which should give several hours of entertainment. **S.G.**

Touchline
Title: *Agent Orange.* ***Supplier:*** *A'n'F, Victory House, Leicester Place, London WC2 7NB.* ***Tel:*** *01 439 0666.*
Machine: *C64.*
Originality: *6/10.* ***Graphics:*** *6/10.* ***Playability:*** *7/10.* ***Value:*** *7/10.*

INDOOR SPORTS

If you are like me and hate moving away from the fire during the cold evenings, then you are in luck. You can now enjoy playing three fast moving indoor games, normally only found in pubs and leisure centres without venturing out



of the house. No, you don't need to extend the house or knock out walls; simply load in Advance's new game *Indoor Sports* and settle down for a few hours of exhilarating fun. Even better, ask a few friends round (get them to bring some drinks), and you could have a tournament.

There are three games included on the disk which is very good value for money. The games are bowling (as in 10 pin), darts and air hockey. There are very easy instructions for each game but carrying them out successfully is another matter.

The first game, bowling, shows an option screen where you can choose the weight of the ball (don't pull any muscles), and the slickness of the alley. You can also decide at which level you want to play.

If you have never been bowling before, believe me it's not as easy as it looks. The hardest thing is keeping your ball out of the gutters which run on either side of the alley, they seem to draw the balls like a magnet. Once you have mastered that you can concentrate on flattening the pins which stand in triangular formation at the far side of the alley. The joystick controls the position of your man and the direction of the ball.

The only thing that remains for you to do is remember to release the ball as it is swung forward. If you fail to do this you fall flat on your face (it's quite embarassing). If you want to put some spin on the ball move the joystick to the left or right as you let the ball go. I'm not going to tell you which spins the ball which way (basically because I couldn't work it out).

Once you've tired of the bowling you can return to the main menu and go on to the more sedate game of darts. When it has loaded you are again presented with an option screen where you have a choice of 301, 501 and 701 games. You can also decide whether or not to start and finish the game with a double. The dart is positioned by moving the joystick to the left or right. To maintain the position you have chosen hold the fire button in, this will put the angle meter into action which determines the size of the arc that the dart moves. Once you are happy with this release the button. The only other thing to set is the power of the throw. This again is set with the fire button. As this is completed the picture changes and you will see a scruffy looking yob throwing the dart for you.

The final game, air hockey, is much simpler but still good fun. You move your "hitter" (that's not my word, it's in the instructions), to block the puck sent by your opponent. The aim is to defend your goal while trying to score in the opposite one.

You can type four names in for each set of three games but only two people can play at a time. Don't worry if you're on your own because the computer makes a pretty good opponent (a bit too good sometimes). The graphics and sound effects are excellent and even if you're not the sporty energetic type, I'm sure you'll agree that the package is a very good buy.

S.G.

Touchline
Title: *Indoor Sports.* ***Supplier:*** *Advance, 17 Staple Tye, Harlow, Essex CM18 7LX.* ***Tel:*** *0279 412441.* ***Machine:*** *C64.* ***Originality:*** *8/10.* ***Graphics:*** *9/10.* ***Playability:*** *7/10.* ***Value:*** *9/10.*

EAGLES NEST

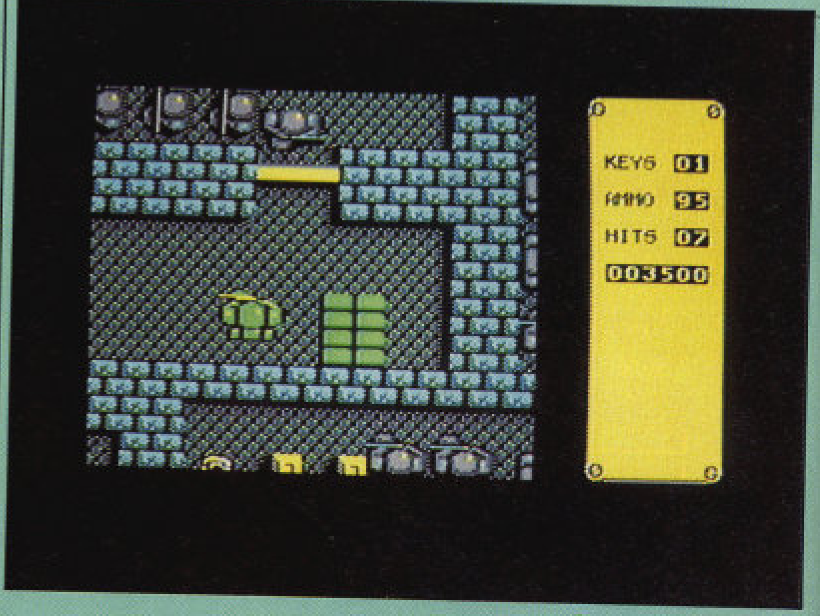
A build up of German troops has aroused your commander's suspicions. It looks as if they are going to try and launch a counter offensive in the near future. Their headquarters is deep within an old castle which is impervious to normal forms of attack.

Sabotage is the only answer, but already, three of your agents have tried to infiltrate the castle and failed. Now it is your turn. Apart from rescuing your colleagues, you must also find a way of blowing up the entire building. On a personal note, you might also have time to pocket a few off trinkets en route as the castle commandant is an ardent art collector.

Into the Eagles Nest presents a top down view of things in the *Gauntlet* style. There are four floors of the castle to explore as you battle past literally hundreds of guards. Keys must be found to open locked doors although some can be shot open. Ammunition should be topped up whenever possible and there are also art treasures, medical supplies, food and lift passes to be collected.

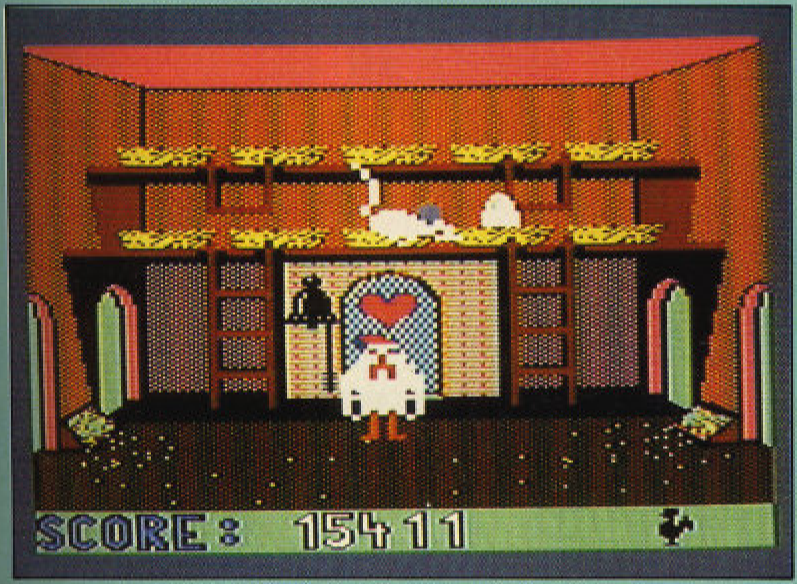
Although it takes two shots to kill a guard, you cannot go round shooting indiscriminately as the last of the saboteurs successfully planted explosives round the place. Accidentally blowing dynamite up is not very good for your constitution, especially as you can only take 50 hits.

Graphically, the game is excellent but is itself a bit slow



and lacking in gameplay slightly. Still, for a first attempt, it is a noble effort and Pandora should be well pleased with it. **G.R.H.**

Touchline
Title: *Into the Eagle's Nest.* ***Machine:*** *C64.* ***Supplier:*** *Pandora, Mercury House, Calleva Park, Aldermaston, Berks RG7 4OH.*
Originality: *7/10.* ***Graphics:*** *9/10.* ***Playability:*** *7/10.* ***Value:*** *7/10.*



CHICKIN CHASE

The French are renowned for their passion and there is a fair dollop of it in this game. Before Mary Whithouse reaches for her censoring pencil though, I should point out that it is all in the best possible taste and done behind closed doors.

You are a cockeral in charge of the hen house and much as you would love to sit around all day pecking corn, you have certain other responsibilities. Not least of which is disappearing behind a door with your good lady hen for a spot of ooh la la. Some time later, she will come out and lay an egg which you must protect from marauding rats, hedgehogs, stoats and snakes who are all out looking for a nice omelette.

Apart from pecking intruders, you must still eat the corn to keep your stength up when you go to visit your chicken. She must be kept in a constant of egg production otherwise your head will feel the force of her rolling pin if the last egg vanishes.

The graphics are fairly crude but the game is quite good fun and is not going to break the bank at £1.99. . **G.R.H.**

Touchline
Title: *Chickin Chase.* ***Machine:*** *C64.* ***Supplier:*** *Firebird.* ***Price:*** *£1.99*
Originality: *7/10.* ***Graphics:*** *4/10.* ***Playability:*** *7/10.* ***Value:*** *6/10.*

BIG DEAL

Two scientists are enjoying a hamburger one day when the conversation turns to the possibility of using robots in fast food restaurants. They come up with a prototype based on Floyd the Droid and submit ther plans to the owner of the BIG (Best In Gastronomy) chain of restaurants. He agrees to give the idea a week's trial and it's up to you to see that everything goes according to plan.

Although you can move Floyd normally, performing other actions involves a series of menus (no pun intended) and two control arms. There is a list of recipes for you to consult in your slack moments. Ingredients can be found in cupboards as well as the fridge and there are plates and glasses to be picked up.

Preparation of the food is most important — hamburgers must be cooked, fish filleted and other items roasted or baked. Timing is crucial here as if you don't deliver the food whilst it is hot, it cools and spoils. Customers get very unhapy is you take too long or get their orders wrong and start throwing furniture about. To solve this problem, you have a supply of three emergency dinners to serve up.

Floyd's left arm does the picking up and cooking whilst his right arm is used for picking up serving boxes or delivering them. When you become proficient in some of the actions, you can actually program Floyd to perform a given sequence but be warned, he remembers your mistakes as well.

The *Big Deal* is totally original in concept, very well programmed and almost totally lacking in gameplay!

Initially difficult, you begin to get the hang of what's going on and then stop for there is no lasting appeal. It's the sort of game that you show your friends but never actually play. **G.R.H.**

Toucline
Title: *The Big Deal.* ***Machine:*** *C64.* ***Supplier:*** *Ariolasoft, 68 Long Acre, Covent Garden, London WC2E 9JH.* ***Tel:*** *01 836 3411.*
Originality: *10/10.* ***Graphics:*** *7/10.* ***Gameplay:*** *3/10.* ***Value:*** *4/10.*



KRAKOUT

There is a theory that there are only six original jokes and everything else is a derivative of one or other of these. It is beginning to look as if the same situation applies to the

computer industry. Remember *Breakout*? Where you control a bat and try to knock bricks out of a wall. Now, try and guess what *Krackout* is about.

Admittedly, comparing *Krackout* with *Breakout* is like putting a Ford Anglia next to a Lotus but there are definite similarities somewhere along the evolutionary tree.

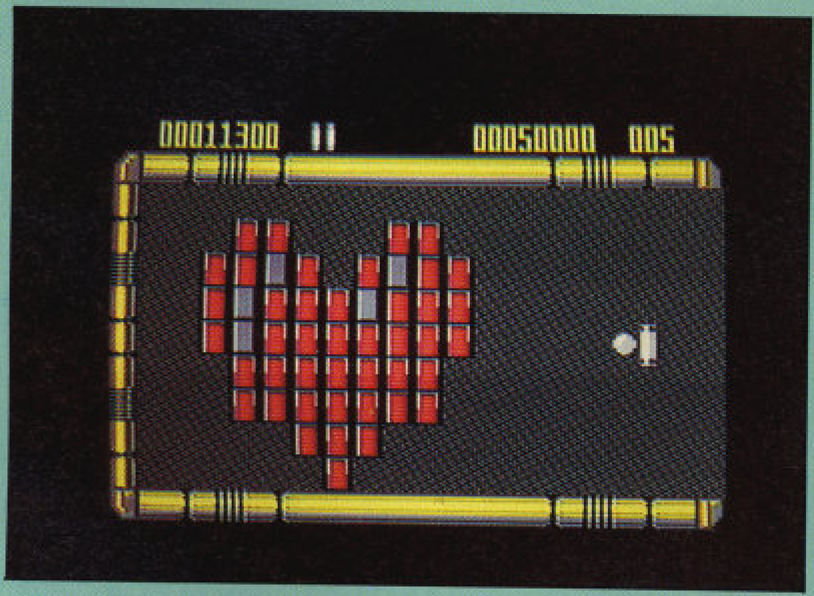
The action takes place over some hundred different screens with the simple objective of removing all the bricks. It is not quite that easy though. To hinder you, there are large numbers of aliens that try to knock the ball out of your path or even worse, freeze your bat altogether. As you progress even further, a jolly little ogre promptly chews your ball and spits the pips back at you!

You do have some weapons at your disposal though. Some of the blocks, instead of disappearing when hit, roll over to reveal a bonus brick. Hit this and one of several things can happen to you. Your bat can expand to double its normal length or you can obtain a protective wall behind you. An extra man is always useful or how about the ball sticking to your bat so you can aim at those tricky bricks stuck in the corners? Then there are bombs and missiles. Each bonus brick is only on screen for a short period of time and each bonus lasts until you pick up the next one.

The game comes complete with a fully comprehensive option screen allowing you to change to left or right handed play, after the speeds and colour etc. There is also the promise of another 100 screens and there is a cheat mode but you can discover that for youself.

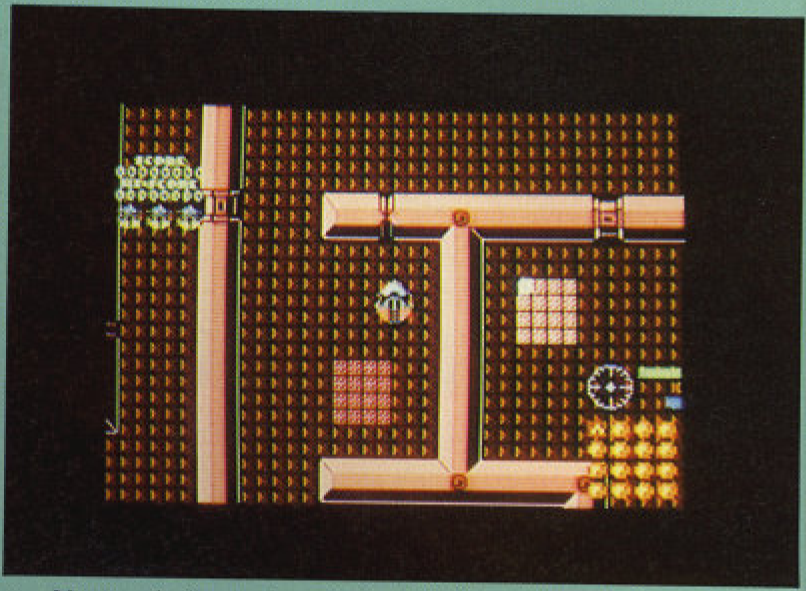
Krakout is very slickly presented but is just lacking a certain something in addictiveness that would turn it into a really top notch game **G.R.H.**

Touchline
Title: *Krackout.* ***Machine:*** *C64.* ***Supplier:*** *Gremlin Graphics, Alpha House, 10 Carver St., Sheffield S1 4FS.*
Originality: *6/10.* ***Graphics:*** *7/10.* ***Playability:*** *8/10.* ***Value:*** *8/10.*



MUTANTS

As one of the few members of a group of dissenters you must fly your ship, the Rainbow Warrior and disrupt the work by the Survivor Zero Corporation who are developing large scale biological weapons.



Your mission takes you to 15 different areas in which you must battle through webs and germs to collect the components of a self destruct system. N.B. Safety tip for evil corporations — don't build self destruct mechanisms!

To collect a component you must blast the virus growing in that sector without letting it touch your craft as it will eat through your shields and destroy your chances of saving the Universe. Unfortunately, your missiles and torpedoes (you can only take one on a mission) will only destroy part of the virus which will quickly grow back to engulf you so you have to move quickly to grab the component and get back to the transporter that will beam you back to the control zone.

Once you're back in the zone you have to fit the component but first you must navigate a mass of passageways to reach the assembly point every time you find a place! You do gain an extra life but it could cost you one through collisions with the energy sapping walls **T.H.**

Touchline
Title: *Mutants.* ***Supplier:*** *Ocean, 6 Central Street, Manchester M2 5NS.* ***Tel:*** *061 832 6633.* ***Machine:*** *C64.*
Originality: *6/10.* ***Playability:*** *6/10.* ***Graphics:*** *6/10.* ***Value:*** *6/10.*

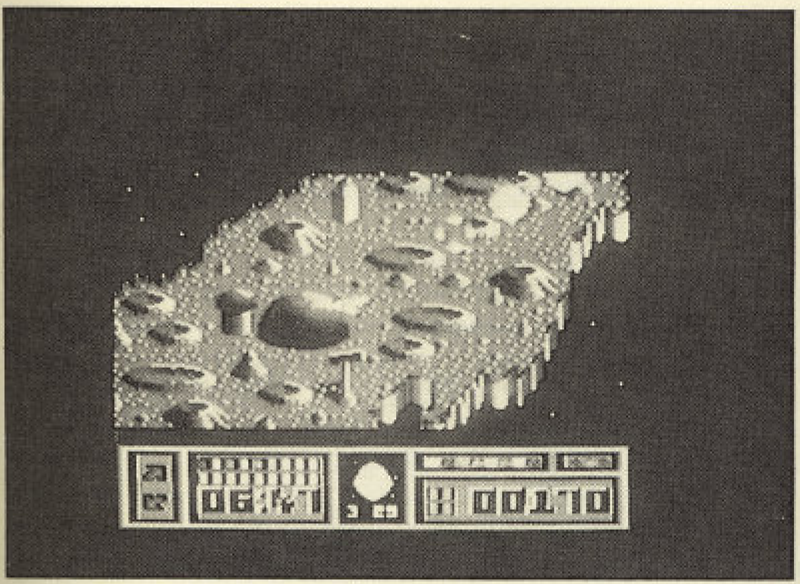
LEVIATHAN

For a change from arcade adventuring, sports games and flight simulators why not try an old fashioned shoot 'em up. It's a reworked version of the classic coin-op Zaxxon but it was apparently inspired by a ZZ Top video! In the "Rough Boy" video the famous red car escapes from its pursuers by flipping into a different dimension.

This inspired English Software's boss, Phillip Morris, to commission a game featuring a ship that smoothly flipped to change direction. The result is a ship that can also fly sideways and roll as it battles countless aliens on three impressive Zaxxon style landscapes.

The screen display shows the 3D flight of your craft through either the crater lunar, laser and towers cityscape and the incredibly cups and statues of the Greek landscape. Below that are displays to show your fuel level that can be topped up by blasting fuel cubes, the alien type and number left to hit as well as your score and time left to complete this level. Run out of time and you run out of game!

Leviathan is an extremely difficult (it must be they give



you five lives!) and well designed shoot 'em up that actually improves Zaxxon's original gameplay.

Touchline
Title: Leviathan. ***Supplier:*** *English Software, 1 North Parade, Parsonage Gardens, Manchester M60 1BX.* ***Tel:*** *061 835 1358.* ***Machine:*** *C64.*
Originality: *5/10.* ***Playability:*** *7/10.* ***Graphics:*** *10/10.* ***Value:*** *7/10.*

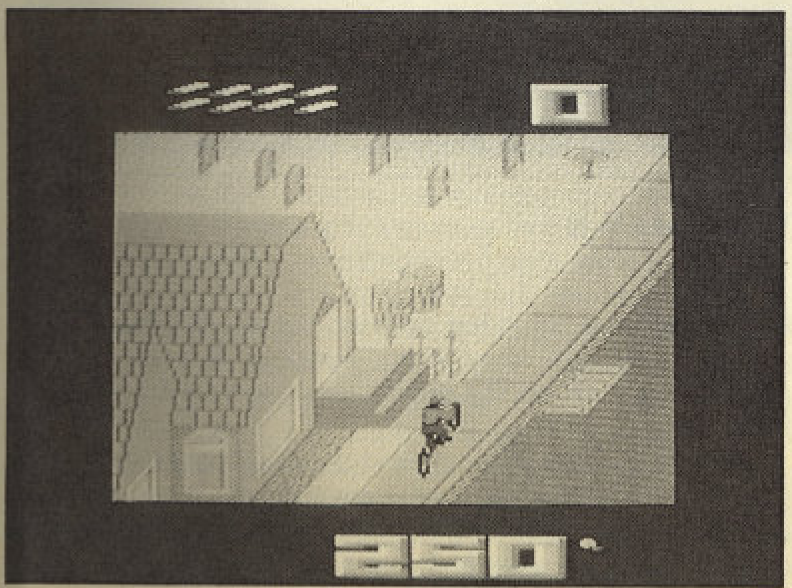
PAPERBOY

A paper round might not sound the most exciting setting for a game but it became an increasingly successful coin-op game that has now been converted for the C64.

Riding his BMX bike, our hero must run the gauntlet of busy streets, bikes and drunks to deliver the Sun to his customers. He begins with only eight copies but he can pick up other bundles during his round.

Delivering papers American style means throwing the papers at doorways, mail boxes or garages and a good shot will score valuable points and keep that customer. Miss out a customer or accidently break a window and they'll cancel their subscriptions. Loosing all your subscribers will end your game even if you've got some of your lives left.

You can easily tell the difference between Sun houses and the others as Sun readers have nice bright clean houses whereas the others are dark and strewn with cobwebs. You



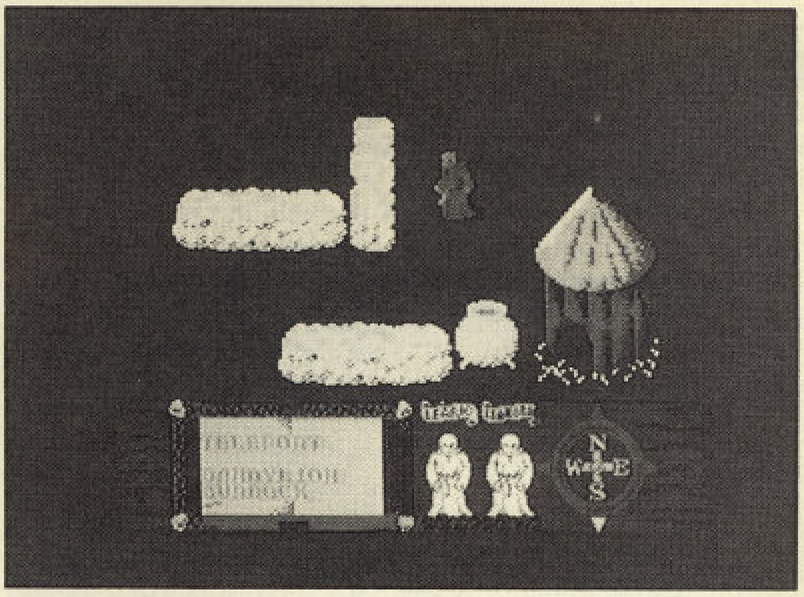
can add to your score through bonus points by breaking windows of non-Sun readers by hurling your spare papers at them. But you should ensure you have enough to make your deliveries.

Surviving the attempts of cats, dogs, cars, bikes and drunks to knock you down is an achievement in itself but if you do manage to complete a street you can earn some more points by hitting targets while you ride through an assault course.

That was Monday.

Survive the whole week and you might learn enough tricks to amaze them in the arcades. T.H.

Touchline
Title: *Paperboy.* ***Supplier:*** *Elite, 55 Bradford Street, Walsall WS1 3QD.* ***Tel:*** *0922 55852.* ***Machine:*** *C64.*
Originality: *3/10.* ***Playability:*** *9/10.* ***Graphics:*** *8/10.* ***Value:*** *8/10.*



FEUD

An ancient feud brings you, Learie, into a magic duel to the death with your brother Leanoric!

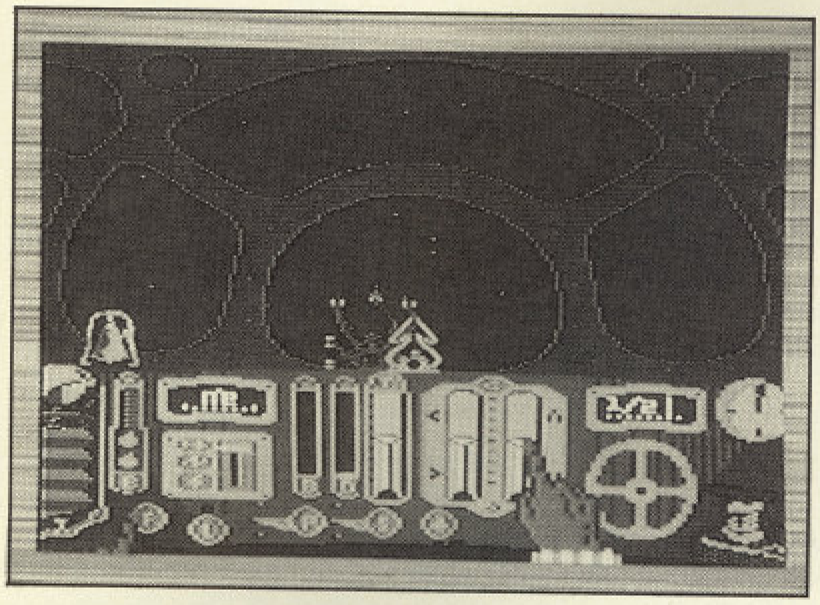
It all started long ago when Leanoric got you hopping mad by turning you into a frog. You were a little green then but now you're almost an equal and your quest for revenge has lead you to the garden of a fellow wizard Heike.

The garden is strewn with herbs that you must collect to mix in your cauldron to make the spells to zap your brother once and for all. Unfortunately, Leanoric will be doing exactly the same thing so it's a race to find the herbs.

There are eleven spells that can be created using the herbs in the garden (each spell requires two herbs) and range from fireball and lightning bolts to teleport, freeze, protect and heal.

The screen looks like an early Ultimate game which gives the game a dated feel but as a budget game it should be popular. T.H.

Touchline
Title: *Feud.* ***Supplier:*** *Bulldog (Mastertronic), 8-10 Paul Street.* ***Machine:*** *C64.* ***Price:*** *£2.99.*
Originality: *5/10.* ***Playability:*** *7/10.* ***Graphics:*** *5/10.* ***Value:*** *5/10.*



TERROR OF THE DEEP

Deep in Loch Ness lurks a danger (not Nessie). Strange creatures rise from the water at night and terrorise the locals. Your job is to seek them out and kill them using a peculiar diving bell.

Unfortunately, the owner of the bell dies just before he can explain its controls so your first job is to make sense of the handles, wheels and pumps that litter the control panel. Before you dive you must point your pencil to the part of the Loch you wish to explore so that the surface ship knows where to drop you.

Below the surface you will soon be able to control the depth by operating the ballast switch, steer left and right and control your speed as long as you've got fuel and oxygen. If the oxygen gets low you can always pump some more but for fuel you have to return to the surface ship.

Your submersible is fitted with three weapon systems that you can switch between to defend yourself with spears, bombs, that you must detonate from a safe distance, and an electric field. These are effective against most fish but what about sea-fairing aliens? You'll know soon enough, as suddenly they'll be upon you and you must get them or they'll surely get you.

Clear the Loch and you'll be a local hero. Fail and the reporters standing by will have a story. Either way you'll be back for more. T.H.

Touchline
Title: *Terror of the Deep.* ***Supplier:*** *Mirrorsoft. Maxwell House, 74 Worship St, London EC4A 2EN.* ***Machine:*** *C64.*
Originality: *8/10.* ***Playability:*** *7/10.* ***Graphics:*** *6/10.* ***Value:*** *7/10.*

ALIENS

Aliens (American style) is the second game of the film based on Ripley's return to Archeron. The last time she was there the rest of the crew of the ill-fated Nostromos were chomped by an alien. Now she's going back to face a planet full of them.

Since her last visit a colony has been set up and wiped out and you've been asked to lead a commando assault.

The British game concentrates on this part of the film and centres around your group's efforts to survive. The American version actually consists of six mini games strung together by the film's plot.

You begin the game in an updated version of Activision's *Master of the Lamps*, only this time you're guiding a drop ship down to the planet' surface. In part two you must guide four of your marines back to the APC (Armoured Personnel Carrier) by guiding them through an Alien infested maze. In part three you must hold them off with a flame thrower while your colleagues cut through a door that will lead you into the air duct and part four sees you scrambling through a Pacman style maze.

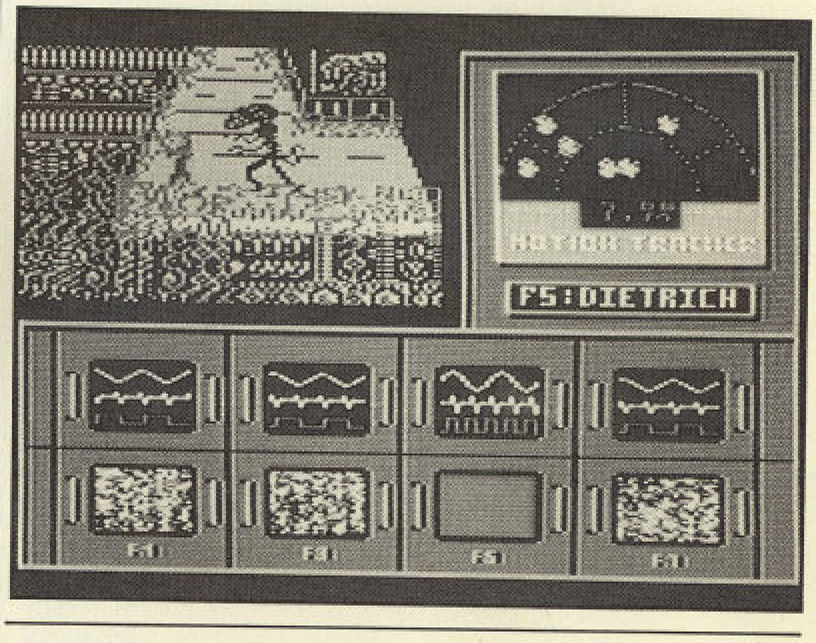
Once you've survived all that, you're not content with safety, instead you want to be a hero and set off to rescue Newt (the cumpulsory cute kid). To add to your troubles, you've only got 17 minutes before the whole planet blows up, and Newt's trapped in the Alien nest, which means trudging back through the maze, only this time you've got a range locator to guide you.

Wearing only a forklift like robotic exoskeleton power loader, you must engage the Queen alien in a final battle to save you, Newt and the rest of humanity.

The game is typically American with superb graphic cartoon style introductions followed by "stick man" animation.

Overall, I prefered the atmosphere of the British version but if you like shoot 'em ups you need look no further for a great "bug hunt"! T.H.

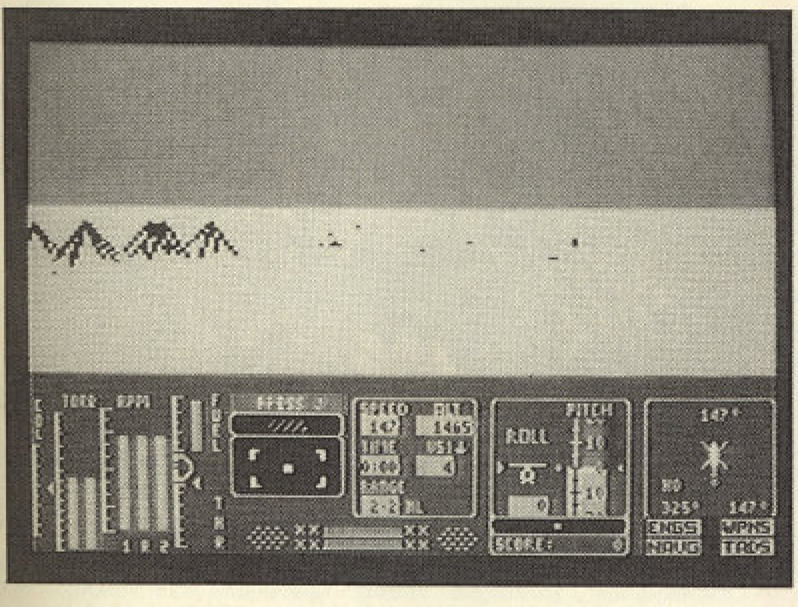
Touchline
Title: *Aliens.* ***Supplier:*** *Activision, 23 Pond Street, Hampstead, London NW3 2PN.* ***Machine:*** *C64.*
Originality: *6/10.* ***Playability:*** *7/10.* ***Graphics:*** *5/10.* ***Value:*** *6/10.*



TOMAHAWK

Digital Integration has been well known in the computer games world for some time. Recently they have been painstakingly producing simulations, accurate down to the finest detail.

The instruction sheet opens out into 20 pages of densely packed information most of it covering the items, devices, and functions in such a skimpy fashion that it is just a cursory glance at what is meant to be happening.



Tomahawk is especially awkward in that it is simulating an attack helicopter. As anyone with any knowledge of flying should know, helicopters are a whole order of magnitude of difficulty ahead of fixed wing aircraft.

With all this complexity you need about 20 keyboard controls to fly the thing and keep a watch on almost 30 on-screen instruments. Very confusing.

The simulation itself is very good. The speed is about right, the graphics reasonable, and accuracy of simulation high. This has got to be the state of the art in flight simulators.

If you really like flight simulators then this one's for you. My only real gripe is that as a glider pilot I can't climb up to maximum altitude, turn off the engine, and do what I know best as easily as I can on other flight simulators.

Also the game will not run on some pre-1985 Commodore 64 operating systems. **M.R.**

Touchline:
Title: Tomahawk. ***Supplier:*** *Digital Integration, Watchmoor Trade Centre, Watchmoor Rd, Camberley, Surrey 3AJ.*
Machine: *C64.*
Originality: *6/10.* ***Graphics:*** *9/10.* ***Playability:*** *7/10.* ***Value:*** *8/10.*

FUTURE KNIGHT

Twenty levels of droids, robots, ghosts and giant catapillars stand between the good knight Sir Randolph and his beloved Amelia.

She has been captured by the evil Spegbott the Terrible and you must bravely attempt to rescue her. Wearing your Omnibolt Mark IV attack suit and carrying a few extra lives you answer an inter-dimensional distress signal and arrive onboard the SS Rustbucket. You must first find an exit to get to the planet's surface then find Spegbott's castle and a final battle with Spegbott and his evil Henchodroid.

Your first task is to stay alive but dying is far easier as you are swamped in defence droids, energy draining pools and slides that slither you to your doom.

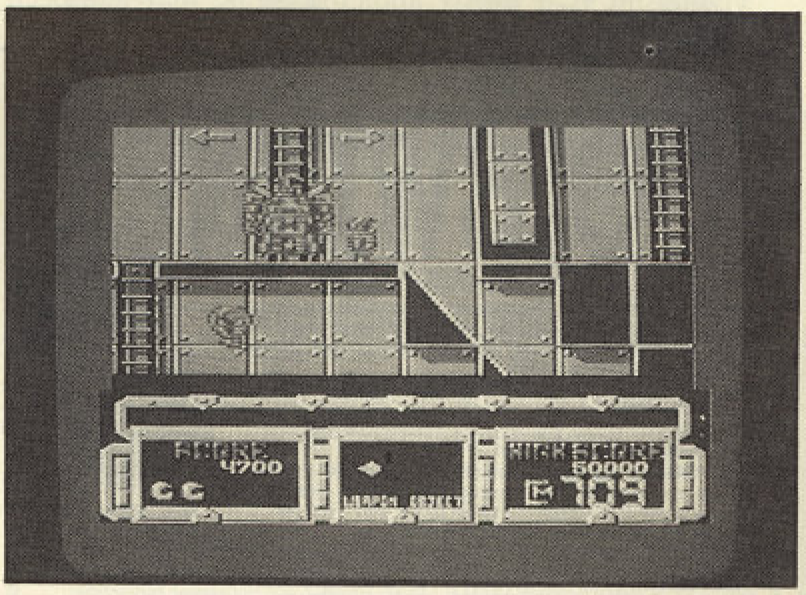
The Rustbucket, and indeed the whole planet, is made from a series of platforms, ladders and slides that our hero must leap around as he searches for a way out and objects to help in his quest. Unfortunately, you can carry only one object and one weapon type around with you at any one time so you should be prepared to do some juggling.

Finding a bomb is a great help as it not only destroys all the critters attacking you but also gives your energy a much needed boost. A confuser stuns the defence droids for a few seconds which should give you a chance to get away perhaps with the help of the platform spell that creates a platform from nowhere or the bridge spell that will give you safe passage over a bubbling pool.

You will also need to acquire the safe pass and securo keys to open locked exits that will lead you to the Henchodroid when only the invaluable destruct spell will save the day.

All the action is presented with some incredible graphics including Sir Randolph (who waves whenever you start a new screen to let you know where you are before it's too late), the slithering array of robots and droids that look as deadly as they actually are. A tremendous mixture of arcade adventure, shoot 'em up with an added dose of platform panic. **T.H.C.**

Touchline
Title: Future Knight. ***Supplier:*** *Gremlin Graphics, Alpha House, 10 Carver Street, Sheffield S14.* ***Tel:*** *0742 753 423.*
Machine: *C64.* ***Price:*** *£9.95.*
Originality: *8/10.* ***Graphics:*** *9/10.* ***Playability:*** *8/10.* ***Value:*** *8/10.*



ESCAPE FROM SINGE'S CASTLE

Subtitled *Dragons Lair II*, this is the second batch of screens from the coin-op classic since less than half were included in the original game.

Having leapt off plummeting disks, defeated hordes of ghouls, skulls and snakes and finally slain the Dragon Singe in part one, you have rescued the fair Daphne. What do you mean you didn't get that far? Go back and finish it immediately as the daring Dirk is off in search of new adventures. The dauntless Dirk has returned to the Dragon's Lair to find a new monster in control in the shape of the scaly Lizard King and eight new challenges to block his path to a pot of gold and freedom.

The first hazard is a suicidal journey full of boulders and whirl pools that must be avoided by following the marked path. Flashes suddenly appear showing you the direction to

take but your reactions must be quick or you'll be grounded on the rocks. This is surprisingly difficult especially when there's only three possible directions (left, right and forward) and countless lives will be lost on the rocks or down the roving whirpools.

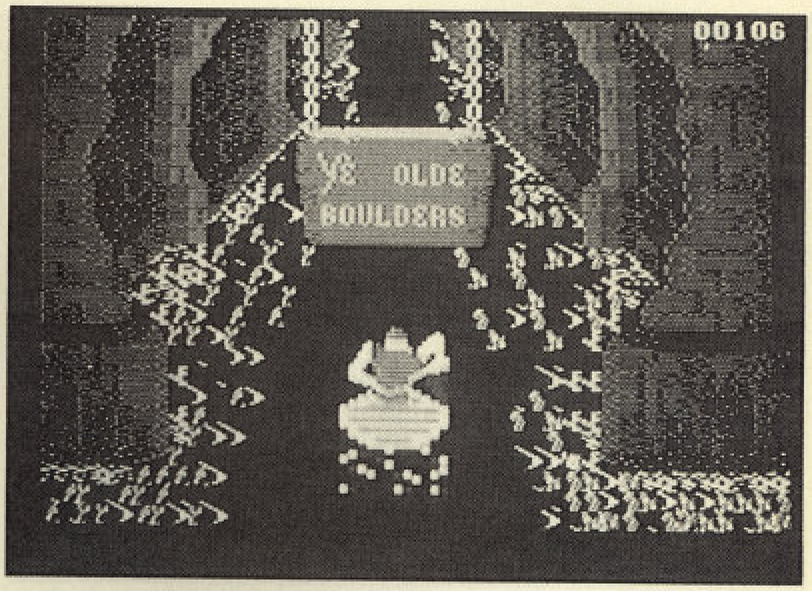
By the time you've completed the watery journey your next challenge will have loaded in using the same play as you load technique that worked well in the original.

As you dry yourself off you're greeted by a giant boulder that hurtles down the slippery corridor towards you. Naturally you take off in the opposite direction but must avoid the holes and boulders that block your path as if you slip the boulder will get you.

Survive that and you must negotiate the traps that are packed into the Throne Room, such as the blazing balls of electric fire, circle of suspicion and a fiery hand before an encounter with the Lizard King. The only problem is that you've lost your sword. Find that and you stand a chance of surviving to ride a magical legless horse as it careers around corridors, the self explanatory Doom Dungeon, the now you see it, now you don't floor of the Mosaic Room and a final scramble past the deadly Mud Monsters.

As in the original most of the gameplay involves pushing the joystick in the right direction as the right time with reactions being the key to success although occasional use of the grey matter is required to plan your next move.

The result is a highly addictive game that has been streamlined for fast play (some of the repetitive introductory screens can be avoided by pressing the fire button) and is sure to repeat the success of the original *Dragon's Lair*. T.H.



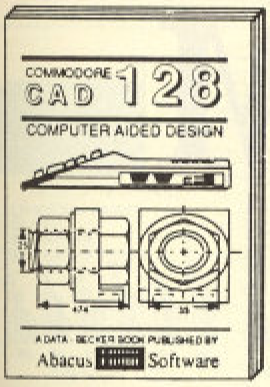
Touchline
Title: *Escape from Singe's Castle.* ***Supplier:*** *Software Projects, Bear Brand Complex, Allerton Road, Woolton, Liverpool L25 7SF.* ***Tel:*** *051 428 9333.* ***Machine:*** *C64.*
Originality: *6/10.* ***Graphics:*** *6/10.* ***Playability:*** *7/10.* ***Value:*** *8/10.*

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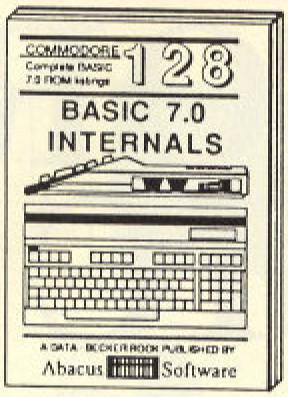
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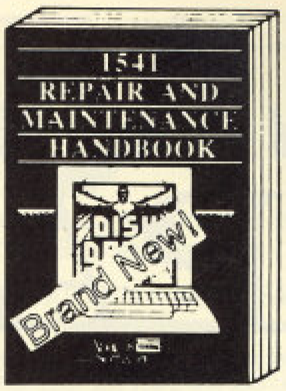
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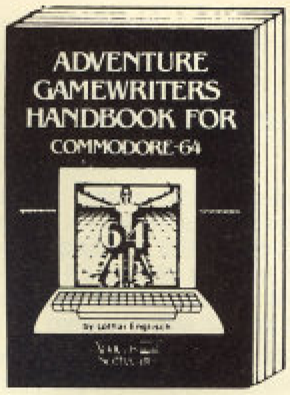
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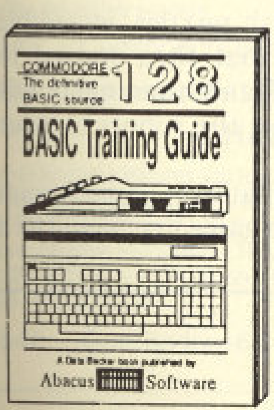
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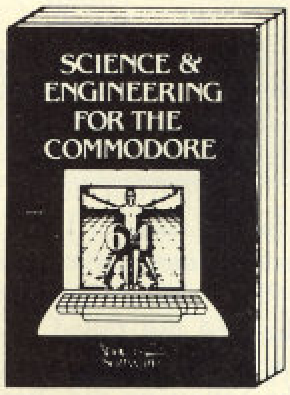
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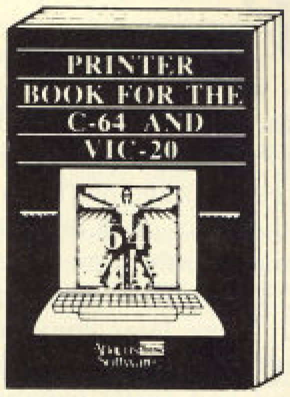
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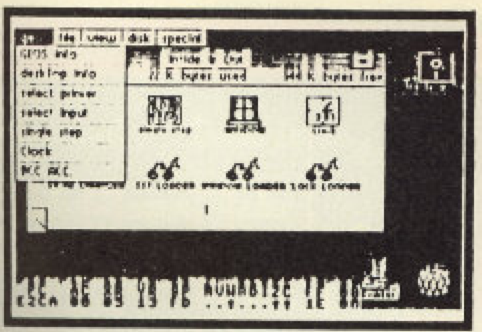
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PLATFORM PANIC

Platform games are a style in their own right. In this tribute to an artform, we look at some of the most influential games of the last couple of years.

By Tony Hetherington

What do games such as *Impossible Mission, Monty on the Run* and *Cauldron II* have in common? They're just three of the incredible number of platform games that spawned from what appeared to be an incredibly limited format.

Three years ago platform games developed from mere copies of the Coin-op Kong and grew into a class of their own thanks mainly to an Atari game called *Miner 2049er* and the UK Spectrum copy *Manic Miner. Manic Miner* and *Jet Set Willy* were later converted for the C64 but failed as they didn't take advantage of the machine's superior colour, sound and sprite capabilities. The following did, became bestsellers and are still among my favourite games.

Impossible Mission

The undisputed king of the platform games that swept all the awards when it was imported first by CBS and then by US Gold. It was the first game to stun its players with the synthesised speech and laughing of the evil Dr Elgin. He's the mad scientist who's threatening to blow up the world and you have to stop him. However this involves searching every object in his 25 room complex while avoiding the attention of the laser firing patrolling robots.

Impossible Mission featured fiendish puzzles, incredible animation (including the character that then starred in *Summer Games* and *Summer Games II*) and stunning sounds ranging from the bleeps and hums of the robots to your metallic footsteps.

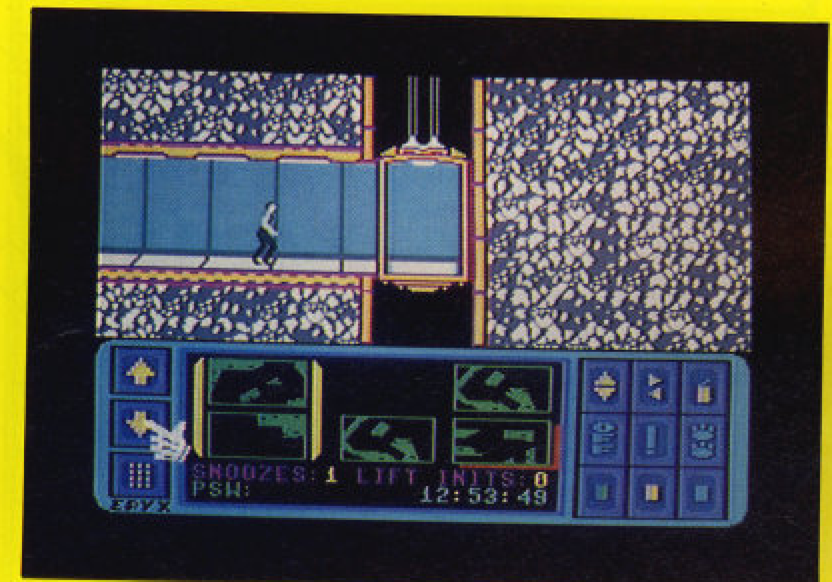
Impossible Mission expanded the platform game format into an arcade adventure and created a game that would be a hit even if it were released tomorrow.

Wizard

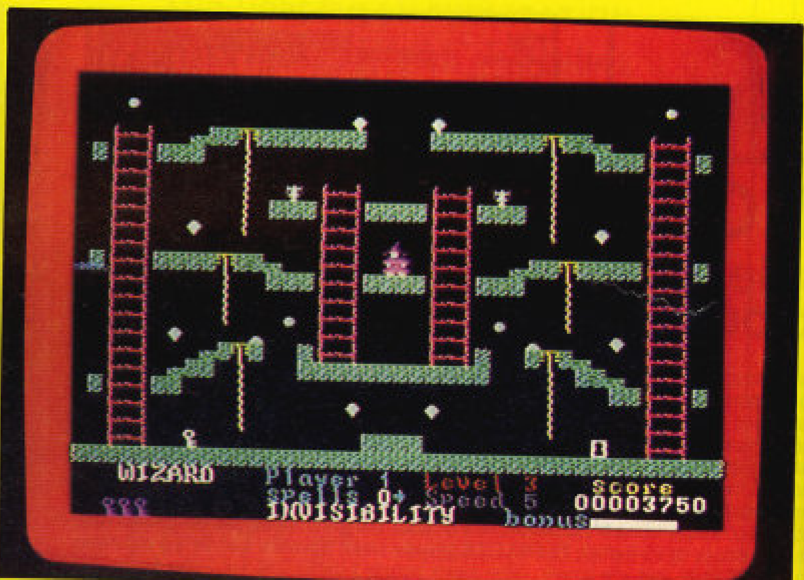
Wizard was first touted by CRL, then by Ariolasoft but neither did it justice as it's a superb platform variant. The object of each screen is to collect a key and take it to a lock to gain entry to the next level. Your route is strewn with trouble from the nasties that pursue you to the fires, disappearing ladders and ropes that block your way.

Played at a variety of levels *Wizard* added the use of player spells such as invisability, freeze or fireballs that were won when you found a key and might just get the lock in tact.

Add to that a screen constructor that can be used to alter existing screens or design your own.

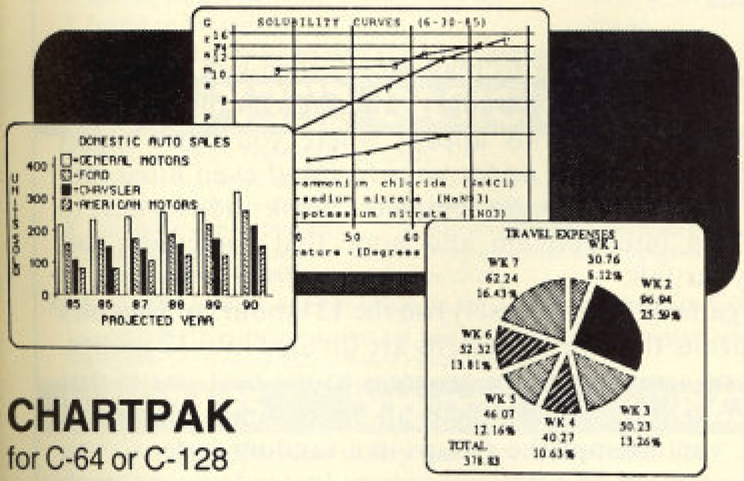


Impossible Mission



Wizard

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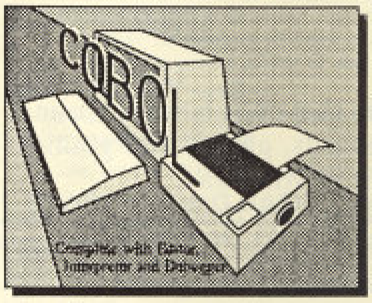
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Bounty Bob Strikes Back

The sequel to the original *Miner 2049er*, *Bounty Bob* from US Gold is a typically addictive platform game packed with impossible leaps and fiendish traps designed to rob you of your last life just before you reach the next level.

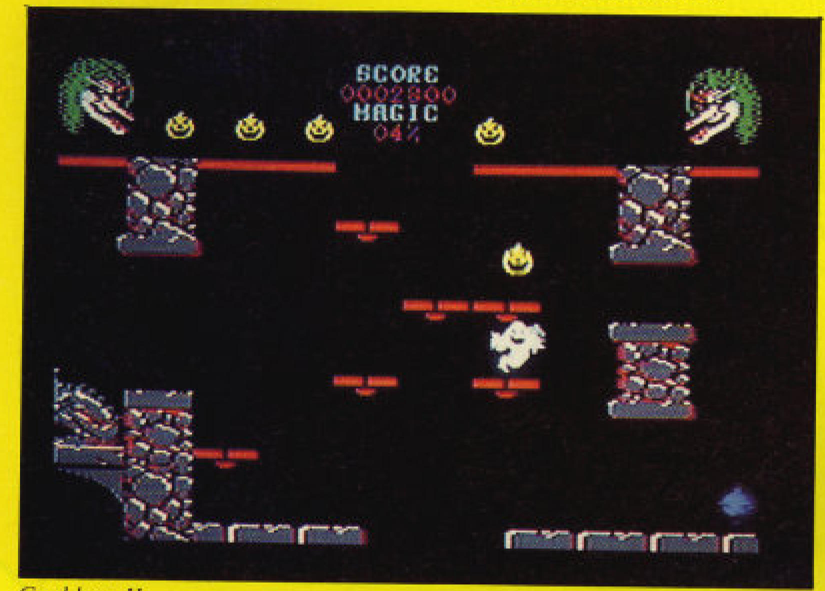
Each screen features a different fiendish mechanism that you must use to cover every platform and so complete it within the time limit. These include hoist lifts, transporters, suction tubes, granary lifts and gravity lifts that are patrolled by multi-coloured nasties. Luckily you can find objects that turn these nasties green for a few seconds. When they're green, that's when you can get them.

Each level demands skill, timing and precision jumping as one mistake could cost you a life. This isn't easy particularly when one screen is aptly named 101 jumps!

Cauldron II

In *Cauldron II* you play a pumpkin that must bounce around a wizard's castle avoiding the guards, ghosts and goulish severed heads and object that get in your way.

Help comes in the form of sparklers that top up your rapidly depleting energy and flashing objects that give you extra power that you'll need to complete the game.



Cauldron II

Controlling the pumpkin is the route to success as timing your joystick presses decides the level and direction of your bounce and whether you land safely on a platform or plummet to your doom.

This game is packed with atmosphere from the crawling monsters to the evil cackle that accompanies the end of another failed game. My favourite is undoubtedly the statues holding plates of sparklers that tip you into oblivion if you don't bounce back in time.

That's just the tip of the iceberg as other favourites include the true two player action of Broderbund's *Castles of Dr Creep*, the cartoon style action of First Star's *Frak!*, 150 screens of redefinable *Lode Runner* action and the leaping action of Datasoft's *Bruce Lee* and *Zorro*.

The best way to track down these stars is probably through compilations that are now swamping the shop shelves although there are signs that the good old platform game is making a comeback through games such as *Auf Wiedersehn Monty* and *Future Knight* from Gremlin.

Hercules

If you need persistence to play Monty then you need sheer courage to play the new budget game *Hercules* from Alpha Omega as the platforms appear where you don't expect them, disappear from under your feet and even burst into flames! Some screens begin completey blank and you have to take a leap into oblivion and hope that something soft breaks your fall.

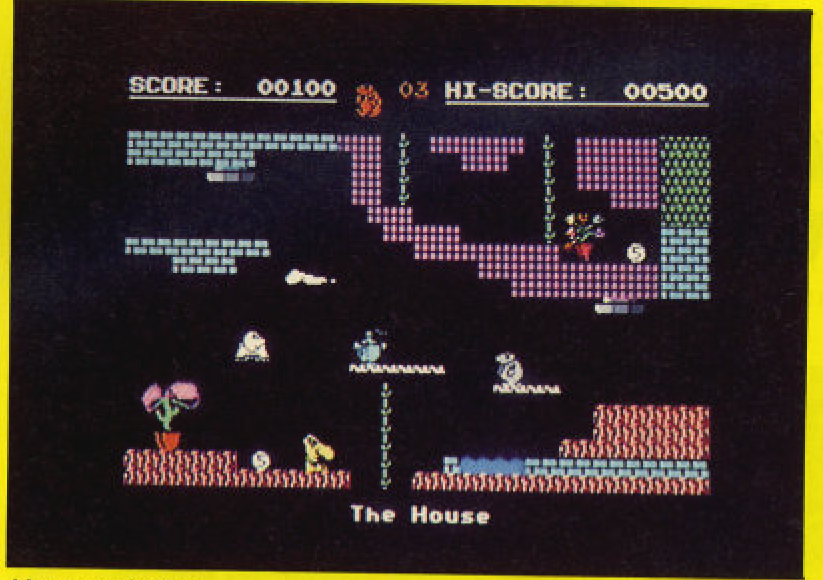
The game is based (loosely) on the 12 labours of Hercules which means that the 50 screens are divided into 12 groups. Finish one screen and you progress to the next one in that group. You have to complete all 50 to finish the game. Luckily, you attempt the groups in a random order so you needn't get stuck on a difficult screen. Instead you get stuck on 12 difficult screens.

Monty on the Run

The third and best in the Monty series of platform games from Gremlin combined superb game action with Rob Hubbard's best music.

Monty Mole now on the run begins in the house and tries to escape through the escape tunnel by avoiding the deadly plungers, incredible array of nasties that range from flying teapots, flapping gloves to ambling big nosed monsters. Meanwhile the action is accompanied by the catchiest tune you're ever likely to hear on a C64.

Monty has remained a mystery to most of its players still struggling to get the poor Mole out of the house never mind on the run. To add to your troubles you have to choose a selection of objects before you begin that ae essential to completing the game. Unfortunately, the only way to find out which objects you need is by trial and error.



Monty on the Run

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These programs are available on disk.

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The Image System

Now all you budding Andy Warhols can create masterpieces using your Commodore 64s.

By Stuart Cook

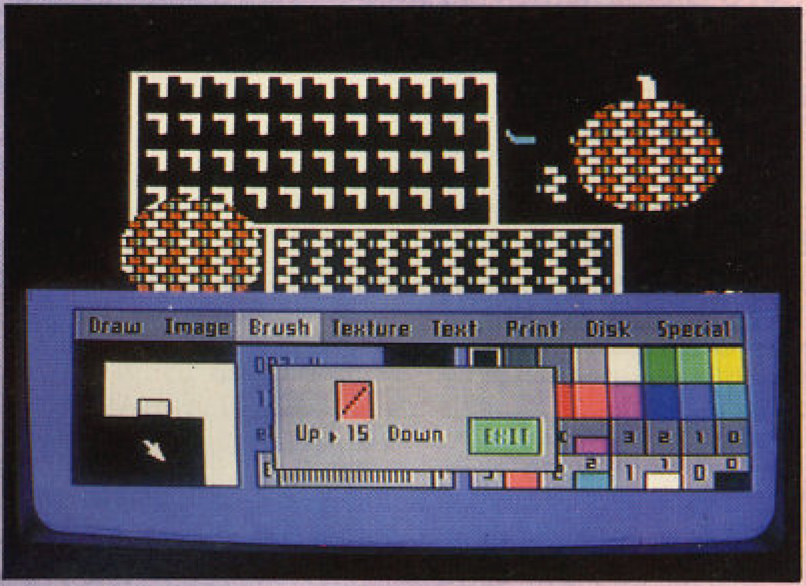
With the vast number of graphics programs already on the market for the C64, you would think that there would be little room for any more. Not so. CRL has just released a second graphics program into the market place.

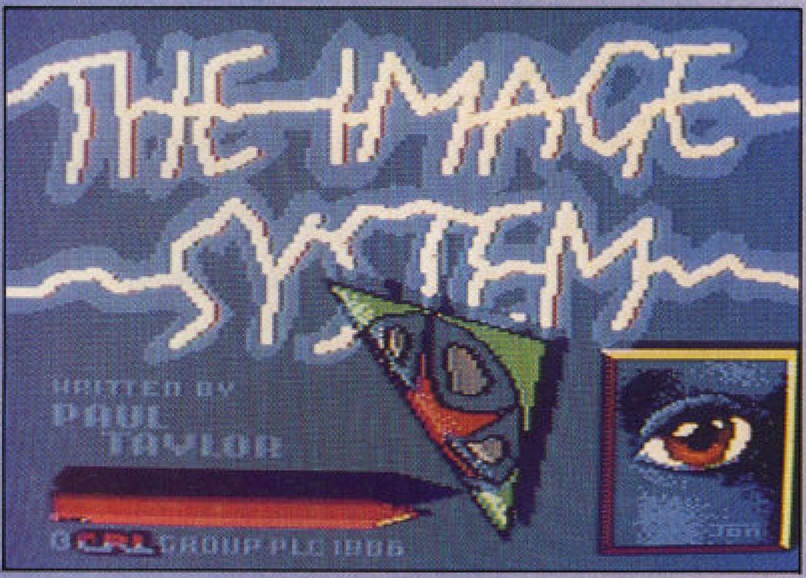
The Image System, does contain all of the usual painting and drawing facilities that we have come to expect from a high quality graphics package, however, it does have a number of 'extra' features which makes it a little special.

Presentation

It seems to have become the norm that any program that is easy to use should be completely controlled by a joystick and all of the necessary options be selected by using pull down menus. *The Image System* is no exception, though you are required to use just three keys on the keyboard for moving between menus and the drawing area.

The actual layout of the package is excellent. The screen is split into two sections, one part shows what is happening on that section of the graphics screen while the other displays the menus, the colours in use and a magnified picture of the area surrounding the cursor etc. You may think that only being able to see half the screen is offputting and makes it difficult to draw anything. Actually the opposite is true as the programmers have been quite clever in their manipulation of the menu.





The Menu

Jumping between the menu and editing displays is again simply a matter of pressing a single key. While in the menu area moving the joystick around moves a pointer to the various options, the fire button being used to make changes, pull down the various menus etc.

The menu displays such information as the x,y position of your cursor, a meter which shows how much image storage space is left, — more on this later — the texture and brush that you are using, the colour palette and how you are

manipulating the colours. The display is extremely clear and very easy to understand.

In Use

Selecting the various menus is simplicity in itself. Move the pointer to the name of the menu that you require, press fire and keep the button held down. The relevant menu will now appear on the screen. Moving the joystick around highlights the different options within the menu. When the correct function is lit release the button and the necessary operation is performed.

Probably the best way to give details of this package is to go through each of the menus in turn detailing each function.

The **Draw Menu** is where you can manipulate the type of drawing that you are using.

Brush Paint allows you to draw on the screen using the current brush type and selected texture.

Spray Paint allows you to use a 'spray can' to colour in an area of the screen, the pressure of the spray and width of the spray are adjustable.

Flood Fill is a standard fill function that colours in an enclosed area of the screen.

Area Colour allows you to change the colours within a rectangular area of the screen.

Colour Scheme is similar to the above option. This allows you to perform such functions as changing all the red colour to blue etc.

Colour Copy lets you copy a rectangular area of colour to another area of the screen.

Single Line enables you to draw a straight line between any two points on the screen. One nice feature is that the line is drawn in the currently selected texture and brush type.

Stitch Line is similar to above except that the line is made up of a series of dots.

Ray Line allows you to draw lines of differing lengths from the same origin.

Ellipse allows you to create circles or ellipses of any size. As with line the ellipse is drawn in the current texture and brush.

Ellipse Fill is similar to the above except that the centre of the shape is filled with the current texture.

Box, as its name suggests, allows you to draw a box on the screen while **Box Fill** does the same but fills in the centre of the shape.

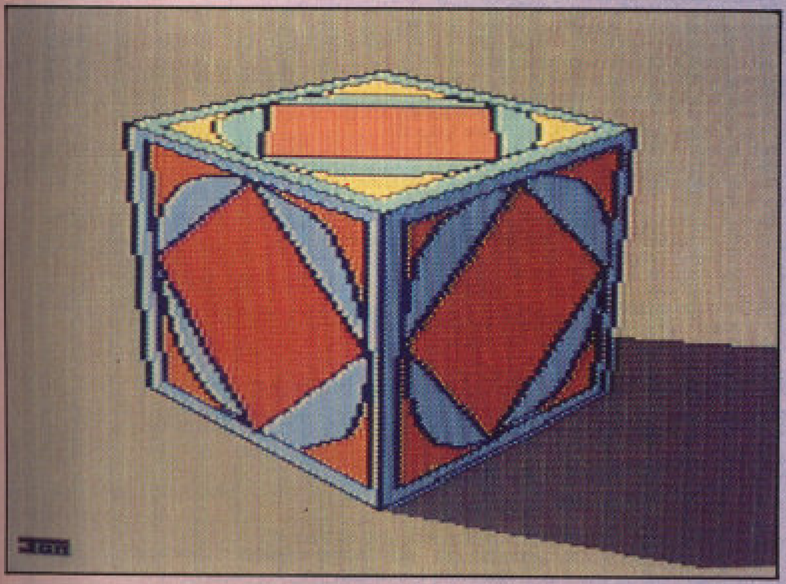




Image Menu

The next menu that you come up against is the Image menu. This is one of the most powerful menus of the package and one that makes the package stand out from many others.

The Image System has the ability to store and manipulate images which you can grab from the screen and store in memory for retrieval at a later time. Up to a maximum of 64 images can be stored in memory but the actual total is limited by the size of the ones stored since you only have so much storage memory available, the afore mentioned menu shows how much is left.

The Select Image option from this menu allows you to specify one of the images. It is possible to give a name to an image allowing you to find it at a later time with ease.

Define Image allows you to select any rectangular area of the screen as an image.

Delete Image erases the currently selected image from the storage memory. A nice touch is that you should choose this option you are asked if you are sure before the delete takes place.

Scale Image allows you to shrink or expand the selected image.

Distort Image also allows you to manipulate the image selected. However, this differs from the above since it allows you to 'twist' the box into any shape you like. It is even possible to cross the shape over itself. I must confess to not having found a use for the above function but it is great fun!

Print Image will print the selected image on to the screen at the specified position.

Brushes and Textures

The type of brush that you are using is selected from the brush menu. *The Image System* includes 32 user-definable brush templates. Brush designs can be 'grabbed' from the screen extremely easy and placed into one of the 32 brush slots. Save and Load options allow you to store your designs on to tape or disk for use in other pictures. It is possible to define where the centre of the brush should be. This makes positioning the brush in a particular position much easier.

Textures are the patterns that you actually draw in. There are 64 different textures available and again these can



be 'grabbed' off the screen and saved to tape or disk. All of the drawing functions of *The Image System* are carried out in the currently selected texture.

Should you require text on your screen *The Image System* allows you to store up to 90 different characters. It is possible to 'grab' characters off the screen and make them any size from one pixel up to 32 pixels wide by 48 pixels high.

Getting it Out

When you have finished drawing your creative masterpiece then you will no doubt want to produce a printed copy of it. *The Image System* provides facilities for dumping the screen to either a Commodore printer or an Epson compatible printer connected to the user port. The image can be printed in two different sizes and the provision for turning the printers auto line feed on and off is also present.

The final menu option is the Special Menu. This is where you can change the colour mode between hi-res and multi-colour, wiping the screen and adjusting the cursor speed.

The Manual

Accompanying the package is a small, but informative, manual of 12 pages. In this, all of the functions of the program are explained in detail. What is good to see is a full explanation of how the pictures are stored. What is even better is that a sample program shows you how to LOAD in the pictures from outside *The Image System* is included in the manual, something that is usually lacking in programs of this sort.

Verdict

The Image System scores extremely highly when compared with many of the graphics packages on the market, though there are some that offer comparable functions and are as easy to use. However, it must be said that *The Image System* is one of the best graphics programs available for the C64.

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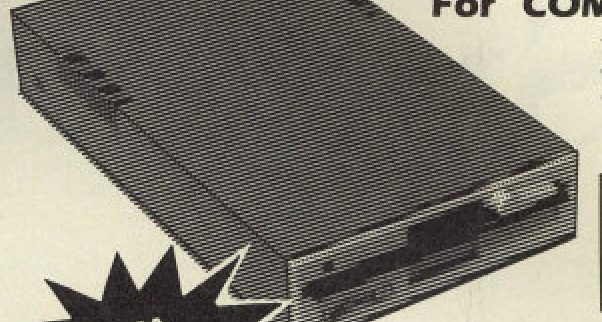
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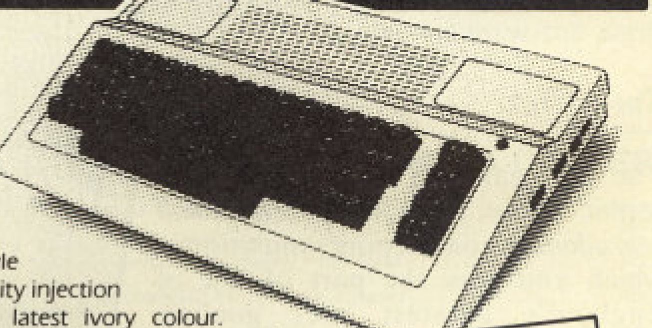
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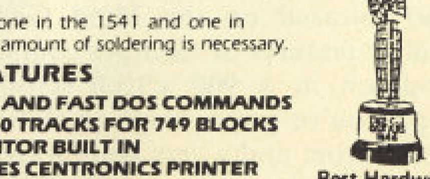


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YOU WON'T BELIEVE YOUR EYES!

THE EFFECT IS STAGGERING.

Now established as **THE parallel operating system** for the 1541 disc drive. Hundreds of satisfied users include business, hobby, full-time programmers, and **many leading software houses, including Gremlin Graphics, Domark, Superior, Alligata, Thalamus, Adventure International, and Software Projects.**

The speed and efficiency is truly unbelievable, it is compatible with **the vast majority of commercial software,** speeding up both the loading of the program **and of SEQ/REL files.** (It is brilliant with Superbase, Easyscript, etc.) For non-compatible programs it can be **completely switched out.** It DOES NOT use a special disc format and your existing discs will be compatible.

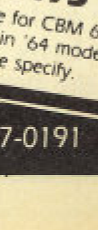
FITTING

Fitting involves the insertion of two sub assembly circuit boards, one in the 1541 and one in the '64/'128. These normally just plug in but on some '64s a small amount of soldering is necessary.

SOME OF THE FEATURES

- 25x FASTER LOADING (PRG FILES)
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(These figures do not allow for searching)



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BACKUP CARTRIDGES

THE FACTS

Almost eighteen months ago, Freeze Frame Mk I revolutionised backup methods. Since then many imitators have appeared on the market. Some of the claims being made for certain of these products are rather misleading. Let us inform you of some positive facts.

1. **Much of the new software released uses "Anti-Freeze"; only Freeze Frame and one other product can handle these.**
2. **Only Freeze Frame can automatically handle these and other programs. You don't need to be an "Expert" or need "O" levels to operate Freeze Frame.**
3. **At press date (11.2.87) our exhaustive tests were unable to find any memory resident program that both Freeze Frame Mk IV and Lazer were unable to back up, completely automatically.**
4. **Similar tests with all rival products proved disastrous.**

THESE ARE THE FACTS (not outrageous advertising claims)

FREEZE FRAME Mk IV

NEW PRICE . . . WHY SETTLE FOR LESS!

Now you can buy a **pedigree Freeze Frame** backup cartridge for a startling new price. **No need to settle for less,** this is the latest development of the originator. **More power, more features, easier to use.**

POWER

Legendary amongst Commodore owners but with continual development now even more impressive.

FEATURES

Three cartridges in one . . . fast load, utilities and backup.

TAPE to DISC — **TAPE to TAPE**
DISC to DISC — **DISC to TAPE**

So simple to use, just plug in and switch on, at the menu choose your option, no messing with software, it's always ready.

Load the program that you wish to backup, press the button on Freeze Frame, then you can either:

1. **Press "D" to save to disc with fast reload.**
2. **Press "S" to save to disc with standard reload.**
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MULTI STAGE PROGRAMS

The standard cartridge will transfer to disc **many tape based multi stage programs, e.g. Summer Games II, Silent Service, Winter Games, etc.** and when used in conjunction with the regularly updated **"F.F. Utility Disc"** the **vast majority** of programs of this type can be handled.

MORE FEATURES

- **Doubles as a fast load cartridge**
- **Loads extra parts fast**
- **Built-in Fast Format**
- **Built-in File Copier (up to 248 blocks)**
- **New "SELECTALOAD" feature (Press "L" for directory, select with cursors, then press F3 to load.**
- **Undetectable by software**
- **Files compressed for disc economy**
- **128/128D compatible in '64 mode**

PROGRAM RELOAD IS INDEPENDENT OF CARTRIDGE

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FREEZE FRAME LAZER

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From the design team that changed the face of backup technology comes **another innovation.** The powers of Freeze Frame have been combined with a **staggeringly quick** new loading system. An **amazing 32K of ROM** provides you with **all the facilities of Freeze Frame Mk IV** as described opposite, plus the stunning new **LAZER** loading technique.

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- **Load speed approx. 20× normal**
- **Save speed approx. 20× normal**
- **Includes RESET**

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Now with **many more** routines to allow the complete transfer from tape to disc of programs that load parts as the program progresses. Used **in conjunction with Freeze Frame** for the awkward ones that cannot be handled by the standard cartridge. Included are routines for most popular games like **Supercycle, World Games, Gauntlet, Trivial Pursuit, Ace of Aces, Dragons Lair I & II (includes training mode), etc., etc.**

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The fifth version of the country's **leading** disc backup/utility program. This latest version includes **many "PARAMETERS"** to handle the latest highly protected discs. This includes the latest **American and English software.** Be warned if you want to back up software by Ocean, Gremlin, Hewson, Domark, and even U.S., Gold whose protection schemes are NOT always the same as the American versions, then you **MUST have "D.D.".** At press date, **we are sure NO other advertised product will handle all these, be it American or German.**

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- **MANY PARAMETERS** (The vital code for the protection schemes)
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Overseas Orders: Within Europe, please send advertised price. Outside Europe, add **£2.00** for Air Mail

Lower Case Graphics

Here's a way to improve your graphics by using the alternative character set.

By D.A. Gardner

Anyone familiar with the Plus/4 or C16 will know that there are in effect two character sets. To switch between these you press the Commodore key and shift key or print characters 14 and 142.

When it comes to the graphics modes however, for some reason we are only allowed to use one of the character sets – the one which contains upper case alpha characters. The Plus/4 and C16 have some versatile and powerful graphics commands, but this inability to print the lower case characters when in graphics mode has always annoyed me slightly. I think a graphics display with a mixture of upper and lower case alpha characters looks superior to one with only upper case.

I have discovered that it is an easy matter to rectify this situation and have both the character sets at your disposal when using any of the graphics modes.

Lower Case

The data for both character sets for the Plus/4 and C16 is held in ROM in addresses $D000 to $D7FF (53248 to 55295) and pointers in RAM enable this data to be used by the screen editor etc. when in low resolution text mode.

There is however a separate pointer in RAM which is used to enable character data to be accessed and printed on the graphics screen. This pointer is at location $02E4 (740) and normally contains the value $D0 (208), which is the high-byte of the start address of the character data in ROM.

The routines for printing in graphics modes access the first half of the character set data (1024 bytes) thus limiting the user to the character set containing upper case alpha characters.

It is a simple matter to increase the pointer at location $02E4 to enable the character set containing lower case characters to be used as well. Poking a value of 212 into location $02E4 from Basic i.e. POKE 740,212 will mean that the second half of the character set data is used (from $D400 to $D7FF). To return to using the character set containing upper case characters poke the original value of 208 back into location $02E4.

I have included a short program which shows how both the character sets can be utilised when using high resolution graphics. YC

PROGRAM: LOWERCASE

```
0 REM * DEMONSTRATION OF LOWER C
ASE ALPHA CHARACTERS IN GRAPHIC
MODES *
1 COLOR0,1:COLOR4,1:COLOR1,6,4
2 GRAPHIC1,1
3 POKE740,208:REM POINT TO CHARA
CTER SET IN ROM WITH UPPER CASE
CHARACTERS
4 CIRCLE1,60,130,25:PAINT1,60,13
0
5 COLOR1,3,4:BOX1,210,100,285,15
0,45,1
6 COLOR1,2,4:CIRCLE1,125,175,15,
18,,,,120:PAINT1,125,175
7 COLOR1,6,5
8 CHAR,0,0,"NORMALLY IN GRAPHIC
MODES YOU CAN ONLY  PRODUCE UPPE
R-CASE ALPHA CHARACTERS
9 POKE740,212:REM POINT TO CHARA
CTER SET IN ROM WITH LOWER CASE
CHARACTERS
10 COLOR1,3,4:CHAR,0,3,"[s B]UT:
":CHAR,0,5,"[s Y]OU CAN USE THE
LOWER CASE ONES AS      WELL!"
11 COLOR1,7,4:CHAR,0,8,"[s A]LL
YOU HAVE TO DO IS [s P][s O][s K
][s E] 212 INTO       LOCATION 740
!"
12 COLOR1,10,4:CHAR,12,12,"[s P]
RESS ANY KEY"
13 GETKEYA$:GRAPHIC3,1
14 CIRCLE1,30,30,15:PAINT1,30,30
15 COLOR1,3,4:BOX1,100,25,125,75
,45,1
16 COLOR1,7,4
17 CHAR,0,14,"[s L]IKEWISE IT MA
KES A CHANGE TO SEE LOWER CASE L
ETTERS IN MULTICOLOR"
18 CHAR,27,15,"MODE AS WELL!"
19 COLOR1,5,4:CHAR,0,17,"ABCDEFG
HIJKLMNOPQRSTUVWXYZ"
20 COLOR1,6,4:CHAR,0,19,"[s T]O
RETURN TO ALL UPPER CASE, POKE 7
40   WITH THE VALUE 208"
21 POKE740,208:REM POINT TO CHAR
ACTER SET IN ROM WITH UPPER CASE
 CHARACTERS
22 COLOR1,2,4:CHAR,12,23,"PRESS
ANY KEY"
23 GETKEYA$:GRAPHIC0,1:GRAPHICCL
R:LIST
```

I.Q.

Here we present you with a wide selection of games, and you'll need to engage your brain to cope with some of these.

HOLLYWOOD HIJINKS

Hollywood Hijinks is the latest work of art to flow from the pens of those masters of the genre, Infocom. As the name suggests, it takes an almighty swipe at the movie industry and anyone who knows their films is going to be guaranteed a lot of laughs.

Your Uncle, Buddy Burbank and your Aunt Hildegarde built up an empire based on a very successful series of B-movies including such never to be forgotten titles as A Corpse Line, Meltdown on Elm Street and Vampire Penguins. Now they have both died and, as they have no children of their own, have left their entire estate to you, their favourite nephew. There is however, one slight catch. In order to prove your worth, you must first discover 10 'treasures' hidden somewhere within their mansion and grounds. And, you only have one night to do it.

The Burbank mansion, as you remember it from youth, is full of assorted props from some of the 600 films your uncle made. He also had a penchant for practical jokes so you have a fair idea of what to expect.

The house is all locked up and your first problem is to find a way in. Outside the front door is a statue that may provide a clue. It is of Buck Palace, an all-American mailman who just happens to act like Rambo as he struggles to deliver the mail. Why does this statue of Buck, armed with bazooka, machine gunes, grenades and rifles etc. rotate to point in different directions?

All Infocom games are text only but the text is of such quality, that pictures could never do it justice. Any daft inputs that you try are quite likely to be greeted with an equally daft response and this is one of the great charms of the game — so much better than being greeted with 'you can't do that' or similar.

The packaging is excellent with an excellent movie magazine called Tinsel Town, full of spoof adverts for hair restorer and articles about three headed boys and psychotic gerbils. As with all Infocom games, I can give no higher recommendation than to suggest that you immediately go out and buy a copy. **G.R.H.**

Touchline

Title: *Hollywood Hijinks.* ***Machine:*** *C64.* ***Supplier:*** *Infocom/Activision, 23 Pond Street, Hampstead, London NW3 2PN.* ***Tel:*** *01 431 1101.*

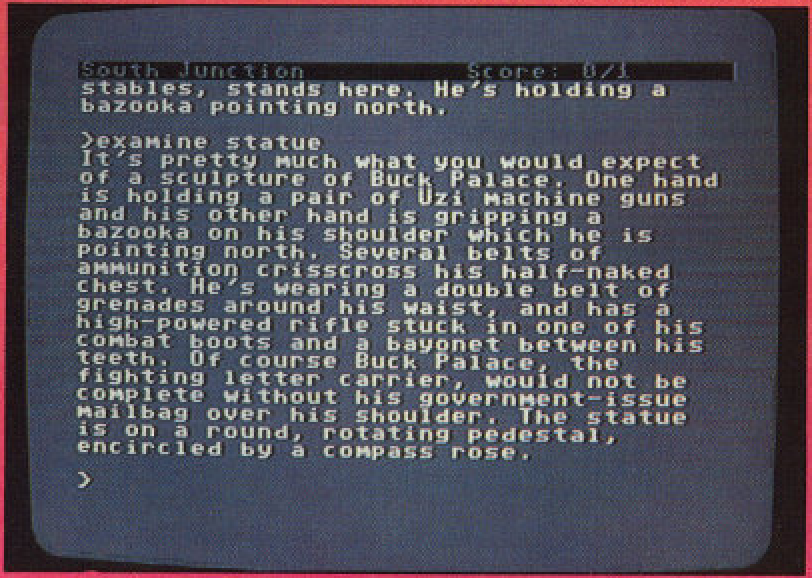
Originality: *9/10.* ***Graphics:*** *N/A.* ***Playability:*** *9/10.* ***Value:*** *9/10.*

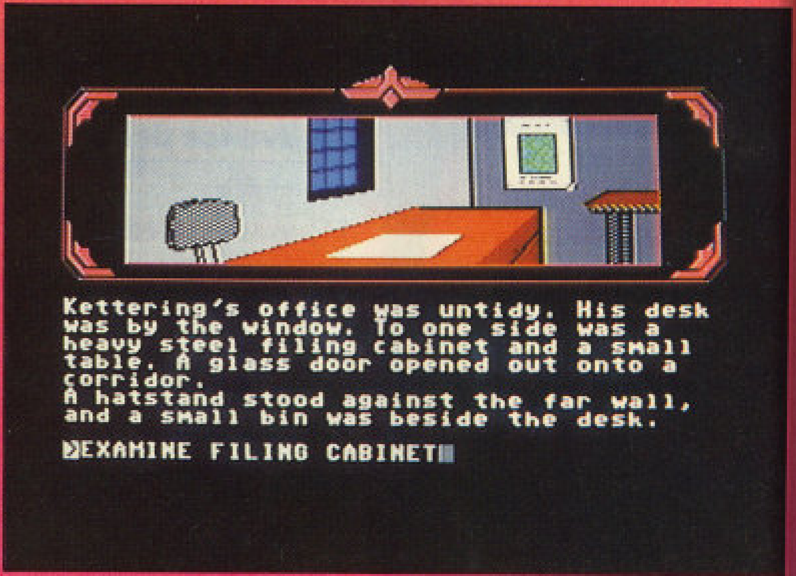
MURDER OFF MIAMI

Two top soap industrialists are amongst the guests taking a luxury cruise. One of them, Bolitho Blane commits suicide by throwing himself into the ocean. The police are called in to investigate. Is it a genuine suicide or is there something more sinister afoot?

You play the part of Kettering, one of Miami's top police detectives in this latest adventure from CRL. The game, written by Fergus McNeill of *The Boggit* and *Robin of Sherlock* fame is based on the original 1930s mystery story by Dennis Wheatley.

The game is in three parts, each one corresponding to one day's investigations. You must discover certain facts within a strict time limit before you are allowed to progress. As well as searching the ship for clues, you also need to talk to the crew and other passengers in an attempt to discover the truth.





And a right suspicious bunch they are too! Top of the suspects must come Carlton Rocksavage, the rival in the soap industry. Could he have put out duff information about the relative state of Blane's company? Blane was always threatening to kill himself rather than face bankruptcy. You will need your best detective's note book and pencil at the ready as the statements are long and you will need to separate the wheat from the chaff.

Murder off Miami was written using the Quill and Illustrator, so the format of the game will be familiar to most adventurers. The plot itself is reasonably well worked and should provide a good challenge for budding amateur sleuths everywhere. **G.R.H.**

Touchline:
Title: *Murder off Miami.* ***Machine:*** *C64.* ***Supplier:*** *CRL, 9 Kings Yard, Carpenters Road, London E15 2HD.* ***Tel:*** *01 533 2918.*
Originality: *6/10.* ***Graphics:*** *5/10.* ***Playability:*** *7/10.* ***Value:*** *7/10.*



ADRIAN MOLE

A game based on the second Adrian Mole book/TV series, your aim is to make Adrian as popular as possible with his family and friends etc.

For any one who has been dead for the last few years, Adrian Mole is a schoolboy suffering from an overdoes of adolescene. Major problems of the day include an ever increasing number of spots, lack of inches below the belt and a girlfriend who, whilst admiring Adrian's intellectual ability, is not over keen on developing the physical side of their relationship. Add these problems to a background of parents splitting up and reuniting and a new baby in the family and it is easy to see why Adrian has so many dilemmas in his life.

The game is exactly the same format as the original Adrian Mole game. Pages of his diary are presented and you are then offered a problem in the form of 'What should Adrian do now — choose A, B, or C'. Depending on your answer, the plot develops slightly differently and Adrian's popularity is affected. Any variations are minor and the game soon comes back to the mainline story.

The game comes in four parts but there is no real substance to it. There is nothing in the storyline that isn't in the book. Try each part a few times choosing different multiple choice answers and you will cover most of the variations. I went through the whole game in an hour and a half and didn't feel in the least like going back to it. My advice is to buy the books (which are excellent) and save yourself a few quid on the deal. **G.R.H.**

Touchline:
Title: *The Growing Pains of Adrian Mole.* ***Machine:*** *C64.* ***Suppliers:*** *Virgin Games, 2-4 Vernon Yard, Portobello Road, London W11 2DX.* ***Tel:*** *01 727 8070.*
Originality: *3/10.* ***Graphics:*** *6/10.* ***Playability:*** *3/10.* ***Value:*** *2/10.*

MASTERS OF THE UNIVERSE

When US Gold obtained the licence for the computer adventures of He-man it decided to do two games. The first was a poor arcade adventure and this, the second, is a graphic adventure.

The villain of the piece is of course Skeletor who has embarked on another attempt to overwhelm Eternia and become the kingdom's absolute ruler. You play Adam, Prince of all Eternia, who is better known as He-man wielder of the Sword of Power and all round good guy.

Your mission is to stop the hordes of Rockbinders that are gnawing through foundations and are heading for Eternia. These innocent creatures are being controlled by hypnotic rays generated by Skeletor's Earthquaker device.

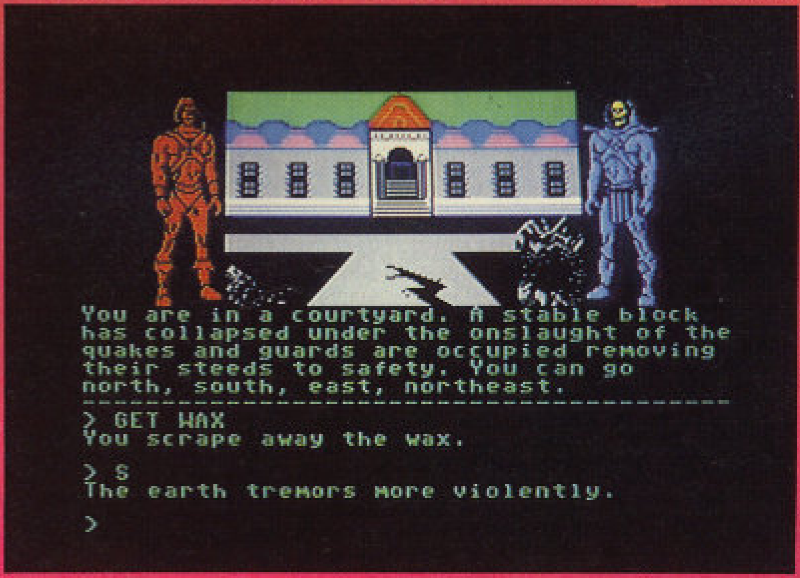
As soon as you feel the initial quakes (and the game has loaded) you dash to your room and open the door to your secret room that houses the Sword of Power. Then you're ready to battle Skeletor, Evil-Lynn and his other minions that he despatched to get you.

The game features a split screen display that combines text descriptions and impressive graphics that add tremendous atmosphere to a Scott Adams style adventure.

Standard adventure commands control your actions and QSAVE, QLOAD and BOM (Back One Move) commands ensure that you survive most mishaps.

A good adveture that does justice to a popular hero and partly makes up for the disappointing arcade game. **T.H.**

Touchline:
Title: *Masters of the Universe.* ***Suppliers:*** *US Gold, Units 2/3, Holford Way, Holford, Birmingham B6 7AX.* ***Tel:*** *021 356 3388.* ***Machine:*** *C64.* ***Price:*** *£9.99.*
Originality: *4/10.* ***Playability:*** *6/10.* ***Graphics:*** *7/10.* ***Value:*** *6/10.*



PORTAL

A long, long time in the future, in a place not so far away, a man returns to Earth after a hundred year mission. You land on a desolate planet with no one in sight. After a few days you find the entrance to an underground complex but still find no-one.

Later you find an instruction book that explains something about the Worldnet and how to work it if your Mindlink is malfunctioning. Since you never realised you had a Mindlink you follow the instructions and are soon into a massive database system. There you meet Homer, a storytelling AI (Artificial Intelligence) unit that seems to have forgotten everything. As the story unfolds you must work together to find out what happened.

Portal is not a game, it's an electronic novel that's spread over five disk sides and by reading the information in the various dataspaces you can gradually "read" the story.

The main plot of the story is revealed by Homer but only after you've prodded his memory by looking things up in the History, Psychology, Geography and Central Processing units. This also provides you with incredible background information that could never be conveyed in a book. For example, if you heard about an uprising referred to in the story you could then check the details in the History file then look up further files and graphs on the characteristics of the main adversaries which would lead to further revelations from Homer.

I'm about halfway through the story, totally bemused



but also completely hooked. I have learned something about a man called Peter Devore who seem to have caused something to happed by entering the wrong dataspace because he knocked over a cup of orange juice yogurt! What he caused and where everybody's gone is still a mystery but I better get back as poor old Homer is losing power to his circuits and if I don't find out the truth and get the people back I'll be marooned on an empty plant for ever. **T.H.**

Touchline:

Title: *Portal.* ***Supplier:*** *Activision, 23 Pond Street, London NW3 2PN.* ***Machine:*** *C64.*

Originality: *9/10.* ***Playability:*** *9/10.* ***Graphics:*** *7/10.* ***Value:*** *8/10.*

YC

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Graphix Pax

There is a wealth of software to help you create all manner of visual effects using your C64. Here we look at just a few of the more outstanding packages.

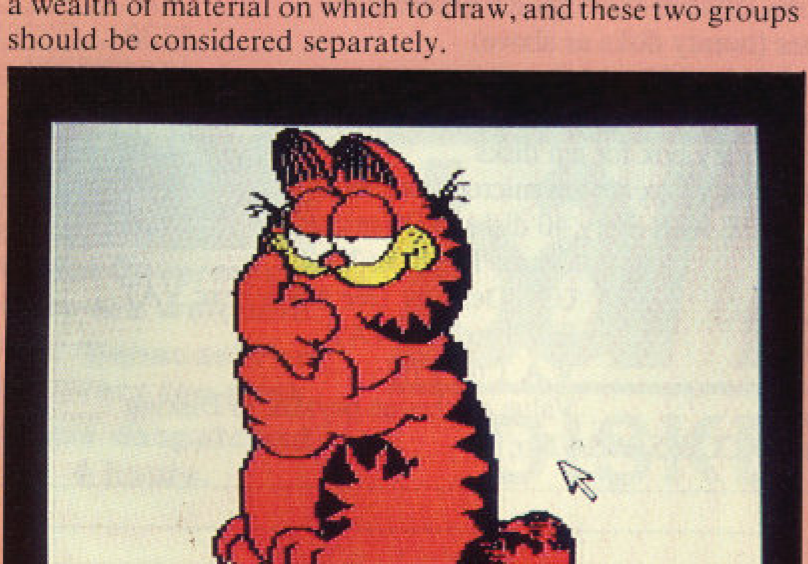
By Evelyn Mills

The Commodore 64 and the 128 are well known for their graphic capabilities. Indeed, programming in Basic itself can produce some excellent results; however such techniques are virtually outmoded by virtue of the wealth of high resolution and colour, bit mapped software available for Commodore users — a prop. plane will get you there, but a jet will do it a great deal faster! So what is available in the 'fast-mode' option?

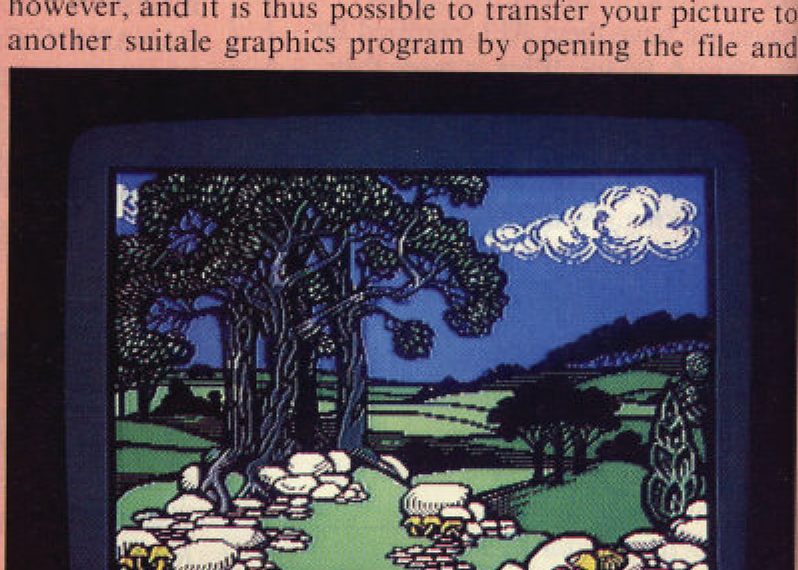
There is a clear division between graphics software; in one group we have programs using keyboard, joystick, light pens, paddles, graph-pads or mouse for direct screen manipulation. The other group relies mainly on the ability to apply specialised commands, via programming techniques, to produce similar results. Each has its own advantages according to the individual. Indeed, Commodore users have a wealth of material on which to draw, and these two groups should be considered separately.

Koala

Firstly — Screen Controlled Graphics. In 1983, Audio Light produced *Koala Painter* and set everything in motion. This program is controlled by joystick or paddles. The now familar features of drawing, circling, boxing, blocking, filling and pattern filling etc. are all available, including a good mirror effect which produces a version of whatever option you are using in quadruple. The zoom function is excellent, screen swapping is possible and a copy option is likewise there. Full use is made of the 16 Commodore colours for paper, ink, filling and pattern filling. All graphics may be saved and reloaded from disk. The drawbacks to this software are: no control of cursor speed; no text to screen; and no printer output. The screen is saved in 40 blocks, however, and it is thus possible to transfer your picture to another suitale graphics program by opening the file and



Koala Pad



Doodle Pad



Art Studio

renaming as required. The graphics produced by *Koala Painter* are of a high standard of resolution. It should be mentioned that a *Koala Pad* is available at considerable expense.

Doodle

Next comes *Doodle*. This, of course, is the program 'par excellence' of 1984. Again, this is joystick and keyboard controlled, but here we have a system incorporating cursor control with speed settings ranging from very slow to very fast, allowing for extreme precision.

The Main Menu in *Doodle* has nine displays (sketch, lines, boxes, circles, zoom, copy, stamp, letter, disk and print). These are selected via the function keys and the keyboard. On choosing any one of these options, a second screen is displayed which gives a detailed account of how to handle the option chosen. It is impossible to enumerate all the options within these sub-menus — there are more than enough to satisfy the most demanding artist (mirror imaging, photo-negative creation, store in memory, recall etc.). An OP-ART fill gives useful parallel lines. Rotate this fill if you wish and you could well use *Doodle* for architectural planning, electronic circuitry and the like. Relative to this there is a GRID available which can pinpoint your drawings accurately.

The letter Mode is well worth considering. While there are no Fonts available, normal lettering may be expanded horizontally or vertically, reversed or rotated in 90 degree steps through the full 360 degrees. Printer output is available in either small or large format.

Doodle is a worthy program. It cannot be grasped in 10 minutes. Work through it however and you have a powerful tool — the graphics screen and instruction screens are readily interchangeable. All screens may be saved to disk and reloaded.

Drawing Board

Now what else is worthy of mention? Plenty! Firstly a 3D *Graphics Drawing Board* (Glentop Publishers Ltd) opened a new concept of graphics entirely. This program is keyboard or joystick controlled and allows three dimensional perspective images to be created rapidly with inbuilt automatic control. Initially a panel of 25 options appears on screen (manual definitely required). There is no difficulty in handling any of the options, but here we have a totally different concept in graphics creation.

Essentially you are handling lines, rectangles, pyramids, prisms, cylinders, cubes etc. Which can all be stretched in part of whole, squeezed, moved, scaled to order, combined, saved in sub-parts and added to other drawings — all of which is automated to your commands and saved to disk. Exact drawing is possible using visible co-ordinates, the horizontal may be reset for technical drawing and scale drawing is a major feature combined with twisting and turning on the x and y axes should you wish. Lines may be erased or 'hidden'.

While there are no fill facilities, you have the option of saving to *Koala* and continuing from there. Printer output is is to the MPS801/803 in normal or enlarged format. This program is readily grasped — the computer does the work!

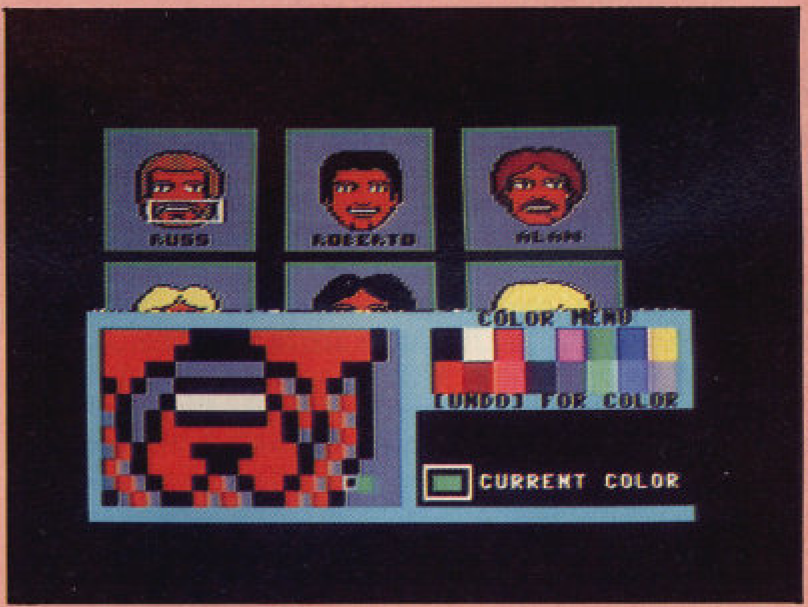
Picasso

As yet, no software has been discussed which uses a light pen — so on to this. To get the maximum stability from any light pen, your TV screen or monitor should be cleaned with an anti-static fluid and brightness control altered to suit the pen. So what is there in the way of supportive merchandise?

Picasso's Revenge (Progressive Peripherals & Software) is a reasonable graphics including light pen. While the operative graphics are fairly standard there is a texture designing feature, a mirror option, where drawings are mirrored in the horizontal or vertical plane, a focus option for the light pen to control drawing speed and a useful Printout facility which allows you to save pictures from 'most other C64 graphics programs'.

These may then be edited with PR, providing your programs are in multi-colour bit map code. *Doodle* graphics may be saved, but not amended, as *Doodle* operates in a high-resolution mode. *Koala* is very acceptable among others. There is also a small Basic Program listed to enabe you to load and view your cretions in Basic. The light pen functions well.

Overall, this software is essentially for the quick draw cartoonist and could be invaluable for pattern designers using the mirror code.



Blazing Paddles

Blazing Paddles

Blazing Paddles has been lurking around the USA for three years and, up until now, has been available, as a straight import, at a price which is in excess of the value of the program. Happily, Datel Electronics is marketing this disk at a most reasonable price indeed. Should you wish a light pen, DATEL will also provide their own at extra cost.

This is a popular program, which is operative with touch tablet, paddles, joystick, paddles and light pen. Again the standard features are all there, but the Main Menu displayed around the screen is very fast in operation. Screen colour is also readily changed with the function keys — very useful for light pen users.

The colour drawing selections are in various modes and three colours may be operated at any one time; pattern filling is available. The cut and paste options are really good. Text to screen has Fonts available inclusive of standard.

A feature of considerable appeal is the 'inbuilt' graphics (animals, transport, shapes, face parts etc.) which may be selected, flipped, rotated in 90 degree steps, transferred to the screen pasted around and colour filled. This is really good for the younger set.

Printer output is, of course, available (good selection). The light pen is good, but my Neos mouse is uncontrollable in BP.

Cadpak

Cadpak (Abacus Software) is available for the C64 and the 128, the latter costing somewhat more than the former. This software is essentially for the designer and has many multiple functions available. Operational procedures are controlled via the keyboard or by light pen, again at extra cost.

This is an extremely flexible program with a Main Menu of 22 functions. Each of these Menus has a sub-menu. Apart from the more standard features of the graphics package, there are other features available: two screen operation, object, Font, object designing and screen swapping to mention but a few. This is not a package for the budding artist, but is intended primarily for design and planning work as the name implies. Scaling, dimension features and text to screen are there or course and printer output (eight printer types) are accurate.

Art Studio

Now to a very versatile, easily handled, mutiloptional, inexpensive program produced by Rainbird. I refer, of course, to *The Art Studio*. The input devices are keyboard, joystick, or a mouse and a *Koala Pad*. The Main Menu appears at the top of the screen and, from this the sub menus of the option you have chosen are then 'pulled down'. Believe me, there are plenty of options here to keep you happy in view of the fact that there are 24 Main Menus alone (all may be made visible by moving the screen up and down).

The Attribute section covers colour handling, and inks may be set to transparent mode allowing nothing to be drawn over it. The Painting option offers 16 pens, eight spray cans for texturing and eight different brushes. One of the brushes is blank, allowing you to colour in areas of the screen assuming you have sketched a black and white drawing.

The Window Option is full of possibilities — cutting and pasting of course, plus increasing or decreasing the size of the window, plus rotational and flipping facilities.

Filling may in solid mode or in 32 predefined patterns. These may be amended to suit your own ideas using the Edit Texture option.

Zooming is there (Magnify), plus a grid control. Text to screen may be horizontal or vertical, in double or treble height/width. Then, again there is a Font editor.

Print output handles five sizes. This, however is limited to certain printers. A feature which is commendable is one where you may print in gradations of grey (colours are interpreted as different shades of grey); furthermore the picture may be printed sideways, left or right hand side of the page or in the middle.

Enough here to satisfy everyone and all easily handled. It won't cost you a fortune.

Artist 64

Artist 64 from Wigmore may be handled with joystick or mouse.

All I can say is that this program deserves the best, you should use the Neos mouse. Indeed your 64 is now virtually transformed into an Amiga. The Neos mouse handles this software with consummate ease and is unbelievably responsive. Of course, the combined software and mouse will set you back £70 — so you must be really prepared to use this program to the full.

The manual is not at all complicated, and the permutations and combinations of Command and Option allow over a quarter of a million different combinations. While I have not worked this out specifically, I am prepared to believe Wigmore giving due allowance for the unreliability of statistics.

It is fundamentally impossible to give a full outline of what is available: naturally all standard features are incorporated plus reserves of unbelievable ingenuity, most of which are found in the SPFX Menu. Also included is an exceptionally powerful text option.

All commands are Menu driven and handled with extreme speed and reliability. Your graphics may be copied to any area of the screen, protected, cycled through various colours, magnified, drawn from a fixed locus with any type of brush you care to design in solid or pattern form, filled, textured, flipped, mirror imaged; arcs may be drawn, part of the screen cleared, and on and on.

Interchange from Menu to screens is very smooth and this is a highly professional tool.

At this point, you must consider whether you are a quick sketcher, a designer or a person seeking an outlet for good artistry on the Commodore. All options are open to you, like any form of painting, computer art demands patience and application.

Simon's Basic

Graphics with Structured Programming is another option for you to consider. Here requisite commands have to be programmed in the standard line format using 'shorthand' commands. This allows for program creation as well as high speed drawing techniques.

Simon's Basic is well known as the forerunner in this field. Fundamentally, the graphics are handled by the draw command s, boxing, blocking, circling etc., while sprites are handled readily and 'music' is available. Naturally there is a great deal in this program apart from the graphics — screen scrolling, line renumbering, merging etc. Many people became rather frustrated with their inability to get to grips with many of the commands, a fact which David Simons realised in his foreword to a book written by Jane G. Reh (Commodore's Handbook of Simon's Basic; Prentice-Hall 1985). For those of you who wish to make full use of this program, reference to this book would be of value.

Ultrabasic 64

In the same year *Ultrabasic-64* was marketed by Abacus Software. This is an excellent program which handles the programming of graphics in a readily understandable form.Quite apart from that, TURTLE graphics have been incorporated which work at very high speed (unlike LOGO). Sprites may be designed on screen or inserted as data statements, and with a little knowledge of screen handling, may be directed around the screen with great facility, rotated etc. Music is best confined to 'sounds' with this program. Text to screen is available in four modes.

All functions are completely interlinked with Basic so you have complete control with respect to programming. Printer output is available in one size and graphics may be saved to disk and recalled as required.

Videobasic

Videobasic-64, a greatly extended form of the above, became available in 1984 but has only recently appeared on the UK market. Roy Wainright, who programmed *Ultrabasic* has really extended himself (as in *Cadpak-64* and *Cadpak-128*). As well as the functions listed above, region copying of graphics is possible. Here a drawing on one part of the screen may be copied to any other part. Two screen handling is also available, which is well detailed in the manual. These two additions give you a very powerful tool.

Music may now be extended to single voice tunes — select the parameters you wish for waveform, attack, sustain etc. Filling and blocking have been extended to pattern mode, while circles may be defined on the x and y axes to give elliptical shapes of any form. Again all this is fully compatible with Basic. Output is to eight printer types in small or large format.

A Royalty Free Makedisk is incorporated allowing free marketing of any programs produced with *Videobasic*.

As a postscript, remember that *Printmaster*, and *Print Shop* allow you to design your own graphics: Print Shop Companion also lets you collect a fragment from *Doodle* to use in *Print Shop* itself. Remember that this is only a two block section — not a lot. There is, of course, also *Newsroom*.

So much is there. No Commodore owner need ever complain of a lack of graphics software! YC

Character Editor

Since the C16 and Plus/4 computers do not have any sprite graphics, the ability to be able to design your own characters is extremely important.

This character editor allows you to design your own characters with ease and save them on disk or tape for later use within your own programs.

Should you require more information on user defined characters then you should take a look at the 'Mastering the C16' article in the November 1985 issue of *Your Commodore* or have a look at the C16 Programmers Reference Guide which is available from ANCO software.

Entering the Program

The program is printed as a memory dump that should be entered using the computers monitor. To do this start the monitor up by typing MONITOR and then pressing return. In order to start entering the program type:

M 1070 and press RETURN

now overtype the numbers and letters of the program with those printed in the magazine, remember to press RETURN at the end of each line. Since the C16 only has a small amount of memory we have saved space by not printing a Basic Loader for this program. You must therefore check every line extremely carefully as a single mistake will prevent the program from working.

Before you attempt to RUN the program you must make sure that you SAVE it just in case you have made a mistake and end up loosing the program in memory.

To SAVE the program enter the following line:

S "CHAPE"ED, DEV 1070, 1823

where dev is 01 for tape use and 08 for disk use.

To Use the Program

Enter the monitor by typing MONITOR

Type L"CHAR ED",dev. Where dev is as above.

When the program has loaded type:

T D000 D7FF 3000

now run the program with G 1215.

The program is made so more parts can be added later, so keep an eye out for improvements.

Just in case you wish to add some extras yourself, I will list the main points you'll need.

$1136	Put char, data on to screen (enlarged) *D5 –height (in char from 1 – 3). *D6 – width, (in char from 1 – 3.)
$1240	Take data from screen and put it into UDG'S
$13CE	turn cursor on and and off (invert the square). *DA – x cord; *DB – y cord.
$11FO	clear screen
$1350	get key (acum holds key value)
$11BE	holds high byte of the char set.
$1300	Prints up the small version of the char data.

note;You must always 'JMP *1350' at the end of your routine.

Figure 1

ARROW KEYS	to move
SPACE BAR	invert a square
CLEAR HOME	clear square
R	rotate tight
L	rotate left
U	up
D	down
+	inc char. no.
-	dec char. no.
O	inc no of char. left/right
I	inc no. of char. up/down
X	flip on 'X'
Y	Flip on 'Y'
H	display HEX equivalent of current char (and onwards). RETURN – to see char

To save your characters, go back into the MONITOR and type ' S"(file name)", DEVICE,3000,3800 ' RETURN

to re-enter the program – ' G1215 ' RETURN

```
>1070 00 FF 00 FF 00 FF 00 FF
>1078 00 FF 00 00 00 20 F0 11
>1080 A2 3C BD A1 10 9D 68 0D
>1088 CA 10 F7 A2 0A 8A 48 A2
>1090 00 A0 00 88 D0 FD CA D0
>1098 F8 68 AA CA 10 EF 60 EA
>10A0 EA 20 20 20 03 08 01 12
>10A8 01 03 14 05 12 20 07 05
>10B0 0E 05 12 01 14 0F 12 20
>10B8 28 03 29 20 0D 2E 04 01
>10C0 09 0C 0C 19 20 20 20 20
>10C8 20 20 20 20 20 20 20 20
>10D0 20 20 20 20 20 20 20 20
>10D8 20 20 31 39 38 36 2E 20
>10E0 0F 0D 20 20 20 20 20 20
>10E8 20 20 20 20 20 20 20 20
>10F0 20 03 03 7E 6E C0 0F 00
>10F8 3C FF 02 66 66 66 3C 00
>1100 A9 08 85 E7 A0 00 B1 E0
>1108 85 E6 20 C4 11 A0 07 B9
>1110 E0 11 91 D0 88 10 F8 18
>1118 A9 28 65 D0 85 D0 A9 00
>1120 65 D1 85 D1 18 A9 01 65
>1128 E0 85 E0 A9 00 65 E1 85
>1130 E1 C6 E7 D0 CF 60 A9 00
>1138 85 D0 85 D2 8D F5 10 A9
>1140 0C 85 D1 85 D3 8D F6 10
>1148 A5 E4 20 A1 11 A5 D5 8D
```

```
>1150 F2 10 A5 D6 8D F1 10 EA
>1158 EA EA 20 00 11 18 A9 08
>1160 65 D2 85 D2 A9 00 65 D3
>1168 85 D3 85 D1 A5 D2 85 D0
>1170 C6 D6 D0 E6 18 A9 40 6D
>1178 F5 10 8D F5 10 85 D0 85
>1180 D2 A9 01 6D F6 10 8D F6
>1188 10 85 D1 85 D3 AD F1 10
>1190 85 D6 C6 D5 D0 C4 AD F1
>1198 10 85 D6 AD F2 10 85 D5
>11A0 60 85 E0 A9 00 85 E1 18
>11A8 26 E0 26 E1 18 26 E0 26
>11B0 E1 18 26 E0 26 E1 18 A9
>11B8 00 65 E0 85 E0 A9 30 65
>11C0 E1 85 E1 60 A5 E6 A2 08
>11C8 A0 00 0A 48 20 D8 11 99
>11D0 E0 11 68 C8 CA D0 F3 60
>11D8 B0 03 A9 20 60 A9 A0 60
>11E0 20 A0 20 A0 20 20 20 20
>11E8 F1 20 CE 13 4C 40 12 EA
>11F0 A9 20 A2 00 9D 00 0C 9D
>11F8 00 0D 9D 00 0E 9D 00 0F
>1200 CA D0 F1 A9 10 9D 00 08
>1208 9D 00 09 9D 00 0A 9D 00
>1210 0B CA D0 F1 60 A9 00 85
>1218 E4 A9 03 85 D5 A9 03 85
>1220 D6 20 F3 12 20 F0 11 20
>1228 36 11 20 05 13 20 CE 13
>1230 A9 00 85 DA 85 DB A5 C6
>1238 C9 40 D0 FA 4C 50 13 EA
>1240 A9 00 85 D0 85 D2 8D F5
>1248 10 A9 0C 85 D1 85 D3 8D
>1250 F6 10 A5 D5 8D F2 10 A5
>1258 D6 8D F1 10 A5 E4 20 A1
>1260 11 4C B3 12 A0 00 A9 00
>1268 85 E6 18 26 E6 B1 D0 20
>1270 7C 12 05 E6 85 E6 C8 C0
>1278 08 D0 EF 60 30 03 A9 00
>1280 60 A9 01 60 A9 00 85 E7
>1288 20 64 12 A4 E7 91 E0 18
>1290 A9 28 65 D0 85 D0 A9 00
>1298 65 D1 85 D1 A4 E7 C8 84
>12A0 E7 C0 08 D0 E3 18 A9 08
>12A8 65 E0 85 E0 A9 00 65 E1
>12B0 85 E1 60 20 84 12 18 A9
>12B8 08 65 D2 85 D2 85 D0 A9
>12C0 00 65 D3 85 D3 85 D1 C6
>12C8 D6 D0 E8 AD F1 10 85 D6
>12D0 18 A9 40 6D F5 10 8D F5
>12D8 10 85 D0 85 D2 A9 01 6D
>12E0 F6 10 8D F6 10 85 D1 85
>12E8 D3 C6 D5 D0 C6 AD F2 10
>12F0 85 D5 60 20 7D 10 A9 00
>12F8 8D 12 FF AD BE 11 8D 13
>1300 FF 60 EA EA EA A9 0C 85
>1308 D1 A9 44 85 D0 A5 D5 8D
>1310 F2 10 A5 D6 8D F1 10 EA
>1318 A5 E4 8D FA 10 A0 00 A5
>1320 E4 E6 E4 91 D0 C8 C6 D6
>1328 D0 F5 AD F1 10 85 D6 18
>1330 A9 28 65 D0 85 D0 A9 00
>1338 65 D1 85 D1 C6 D5 D0 DD
>1340 AD F2 10 85 D5 AD FA 10
>1348 85 E4 60 EA EA EA EA EA
>1350 20 5C 13 4C 25 14 60 03
>1358 4C 25 14 60 A5 C6 C9 40
>1360 F0 FA C9 30 D0 03 4C E0
>1368 13 C9 33 D0 03 4C D5 13
>1370 C9 2B D0 03 4C F6 13 C9
>1378 28 D0 03 4C EB 13 C9 3C
>1380 D0 03 4C 09 14 60 A9 00
>1388 8D E0 10 8D E1 10 A6 DB
>1390 F0 14 18 A9 28 6D E0 10
>1398 8D E0 10 A9 00 6D E1 10
>13A0 8D E1 10 CA D0 EC 18 A6
>13A8 DA F0 07 8A 6D E0 10 8D
>13B0 E0 10 A9 0C 6D E1 10 8D
>13B8 E1 10 60 A0 00 AD E0 10
>13C0 85 D0 AD E1 10 85 D1 B1
>13C8 D0 49 80 91 D0 60 20 86
>13D0 13 20 BB 13 60 20 CE 13
>13D8 E6 DA 20 CE 13 4C 19 14
>13E0 20 CE 13 C6 DA 20 CE 13
>13E8 4C 19 14 20 CE 13 E6 DB
>13F0 20 CE 13 4C 19 14 20 CE
>13F8 13 C6 DB 4C 1F 14 A2 70
>1400 A0 FF 88 D0 FD CA D0 F8
>1408 60 20 CE 13 A0 00 B1 D0
>1410 49 80 91 D0 E6 DA 20 CE
>1418 13 20 40 12 4C FE 13 20
>1420 CE 13 4C 19 14 C9 36 D0
>1428 0E 20 53 16 E6 E4 20 36
>1430 11 20 05 13 4C 5D 16 C9
>1438 2E D0 0E 20 53 16 C6 E4
>1440 20 36 11 20 05 13 4C 5D
>1448 16 C9 39 D0 0C 20 F0 11
>1450 20 40 12 20 05 13 4C 50
>1458 13 C9 11 D0 03 4C 65 14
>1460 4C C0 14 EA EA 20 A2 14
>1468 A9 00 85 D0 A9 0C 85 D1
>1470 A2 18 A4 D6 B1 D0 48 88
>1478 B1 D0 C8 91 D0 88 C0 00
>1480 D0 F5 68 91 D0 18 A9 28
>1488 65 D0 85 D0 A9 00 65 D1
>1490 85 D1 CA D0 DD A5 DE 85
>1498 D6 20 CE 13 20 40 12 4C
>14A0 50 13 A5 D6 85 DE A9 00
>14A8 18 26 D6 18 26 D6 18 26
>14B0 D6 20 CE 13 C6 D6 60 60
>14B8 FF 00 FF 00 FF FF 00 02
>14C0 C9 1E F0 03 4C 47 15 20
>14C8 CE 13 EA EA EA A5 D5 8D
>14D0 F2 10 A9 00 85 D0 85 D2
>14D8 A9 0C 85 D1 85 D3 A5 D0
>14E0 A5 D5 18 2A 2A 2A 85 D5
>14E8 EA EA A0 18 B9 00 0C 48
>14F0 88 10 F9 A2 18 A0 28 B1
>14F8 D0 A0 00 91 D0 18 A9 01
>1500 65 D0 85 D0 A9 00 65 D1
>1508 85 D1 CA 10 E8 18 A9 28
>1510 65 D2 85 D2 85 D0 A9 00
>1518 65 D3 85 D3 85 D1 C6 D5
>1520 D0 D1 38 A5 D0 E9 28 85
>1528 D0 A5 D1 E9 00 85 D1 A0
>1530 00 68 91 D0 C8 C0 19 D0
>1538 F8 AD F2 10 85 D5 20 CE
>1540 13 20 40 12 4C 50 13 C9
>1548 19 F0 03 4C A0 15 20 CE
>1550 13 EA A9 00 85 D0 A9 0C
>1558 85 D1 A5 D6 8D F1 10 18
>1560 2A 2A 2A 85 D6 C6 D6 A2
>1568 18 EA 20 86 15 18 A9 28
>1570 65 D0 85 D0 A9 00 65 D1
>1578 85 D1 CA D0 ED AD F1 10
>1580 85 D6 4C 97 15 60 A4 D6
>1588 B1 D0 48 88 10 FA A4 D6
>1590 68 91 D0 88 10 FA 60 20
>1598 CE 13 20 40 12 4C 50 13
>15A0 C9 2A D0 03 4C AA 15 4C
>15A8 00 16 EA EA 20 A2 14 A9
>15B0 00 85 D0 A9 0C 85 D1 A2
>15B8 18 A0 00 B1 D0 48 C8 B1
>15C0 D0 88 91 D0 C8 C4 D6 D0
>15C8 F5 68 91 D0 18 A9 28 65
>15D0 D0 85 D0 A9 00 65 D1 85
>15D8 D1 CA D0 DD A5 DE 85 D6
>15E0 20 CE 13 20 40 12 4C 50
>15E8 13 A5 D6 85 DE A9 00 18
>15F0 26 D6 18 26 D6 18 26 D6
>15F8 20 CE 13 C6 D6 60 EA EA
>1600 C9 21 F0 03 4C 28 16 A5
>1608 D5 C9 03 90 04 A9 00 85
>1610 D5 E6 D5 20 CE 13 20 F0
>1618 11 20 36 11 20 05 13 20
>1620 FE 13 4C 50 13 20 FE 13
>1628 C9 26 F0 03 4C 66 16 A5
>1630 D6 C9 03 90 04 A9 00 85
>1638 D6 E6 D6 20 CE 13 20 F0
>1640 11 20 36 11 20 05 13 20
>1648 FE 13 4C 50 13 20 FE 13
>1650 4C 50 13 20 CE 13 20 40
>1658 12 20 A1 11 60 20 CE 13
>1660 20 40 12 4C 50 13 C9 12
>1668 F0 03 4C E5 16 20 DE 16
>1670 20 C1 16 A9 00 85 D0 A9
>1678 0C 85 D1 A5 D5 8D F2 10
>1680 18 2A 2A 2A 85 D5 AA 18
>1688 A9 28 65 D0 85 D0 A9 00
>1690 65 D1 85 D1 CA E0 01 D0
>1698 EE A0 18 B1 D0 48 A9 20
>16A0 91 D0 88 10 F6 20 04 DF
>16A8 A0 00 68 99 00 0C C8 C0
>16B0 19 D0 F7 AD F2 10 85 D5
>16B8 20 05 13 20 C8 16 4C 50
>16C0 13 20 D2 16 20 36 11 60
>16C8 20 D2 16 20 CE 13 20 40
>16D0 12 60 A9 20 8D BC 0C 8D
>16D8 BD 0C 8D BE 0C 60 20 CE
>16E0 13 20 40 12 60 C9 17 F0
>16E8 03 4C 00 18 20 CE 13 A9
>16F0 00 85 D0 85 D2 A9 0C 85
>16F8 D1 85 D3 A5 D5 8D F2 10
>1700 18 2A 2A 2A 85 D5 C6 D5
>1708 A6 D5 18 A9 28 65 D2 85
>1710 D2 A9 00 65 D3 85 D3 CA
>1718 D0 F0 E6 D5 66 D5 A6 D5
>1720 20 35 17 CA D0 FA AD F2
>1728 10 85 D5 20 60 17 20 FE
>1730 13 4C 50 13 EA EA A0 17
>1738 B1 D0 48 B1 D2 91 D0 68
>1740 91 D2 88 10 F3 18 A9 28
>1748 65 D0 85 D0 A9 00 65 D1
>1750 85 D1 38 A5 D2 E9 28 85
>1758 D2 A5 D3 E9 00 85 D3 60
>1760 20 CE 13 20 40 12 60 C9
>1768 1D F0 03 4C 50 13 A9 10
>1770 85 D0 EA A9 30 85 D1 A5
>1778 E4 85 D2 20 67 C5 A9 20
>1780 20 D2 FF A9 20 20 D2 FF
>1788 A9 2D 20 D2 FF A9 20 20
>1790 D2 FF A5 D2 8D 00 0C A2
>1798 08 20 AF 17 CA D0 FA A5
>17A0 C6 C9 01 F0 07 C9 0D D0
>17A8 F6 4C DA 17 4C CF 17 A0
>17B0 00 B1 D0 48 18 A9 01 65
>17B8 D0 85 D0 A9 00 65 D1 85
>17C0 D1 68 86 D4 20 10 FB A9
>17C8 20 20 D2 FF A6 D4 60 E6
>17D0 D2 A5 C6 C9 40 D0 FA 4C
>17D8 7B 17 20 F0 11 20 05 13
>17E0 20 36 11 AD BE 11 8D 13
>17E8 FF A9 00 8D 12 FF 4C 50
>17F0 13 A9 C4 8D 12 FF A9 D1
>17F8 8D 13 FF 4C 07 18 EA EA
>1800 C9 1D F0 ED 4C 50 13 A5
>1808 E4 20 A1 11 A5 E0 8D 6F
>1810 17 A5 E1 8D 74 17 4C 6E
>1818 17 EA EA EA EA EA EA EA
>1820 04 06 04 04 0E 0C 0E CE
```

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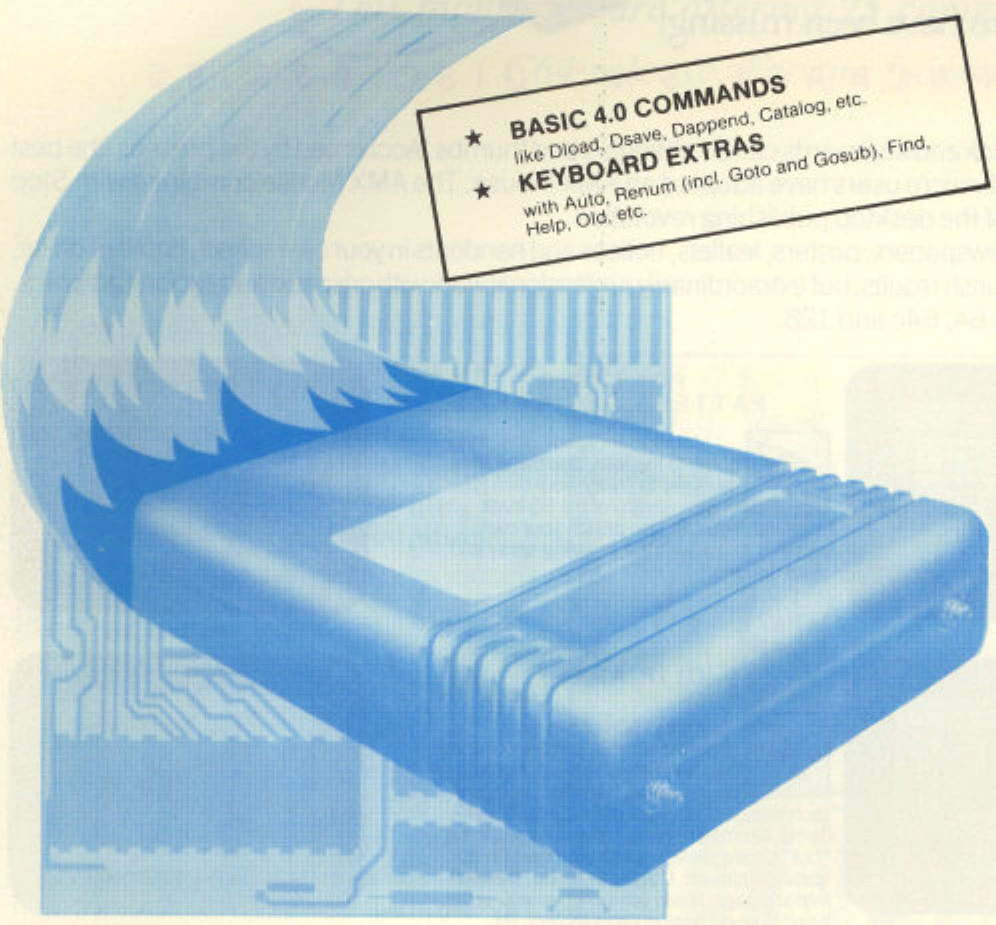
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CONTENTS

AMIGA NEWS

New Amigas

On 4 March, Commodore announced the addition of two new Amigas to bring the range up to three. The new models are the A500 and the A2000.

New Home Model

The A500 is being hailed by Commodore as the ultimate upgrade machine for users of C64s, Sinclair Spectrums, BBCs and other machines. Utilising the technology of the A1000, the Amiga A500 will be the ultimate leisure machine with unrivalled feature film animation, hi-fi sound and very high quality software.

It will multi task in the same way as the A100 giving the user the opportunity to have, live on screen, a word processor with a few documents open, a database and a spreadsheet with full graphics capability.



A500

Commodore UK'S MD, Chris Kaday said: "Commodore have developed another product which will dictate the shape of the market. The Amiga 500 really does represent the ultimate low cost computer. Fantastic games, superb music capabilities, video capabilities are all available to the highest possible standard. That would be enough to ensure that the Amiga A500 is a success, but when combined with multi-tasking, the benefits for home productivity applications are outstanding.

"For the first time, leading edge 16/32 bit technology is available in the home in the same time scale as it is being released in the industry. A very exciting opportunity for anyone interested in a computer."

Specifications

The Amiga A500 offers the Amiga stanard Motorola 68000 plus 3 chip word processor system with 512K RAM which is internally expandable to 1Mb. It comes with a mouse as a WIMP system. The integral keyboard is a high quality business layout. One in-built 880K 3.5inch floppy drive is included with the opportunity to add two additional drives.

There are PC compatible and parallel ports and Amiga systembus expansion. A modulator and 0.5Mb RAM board with built in clock calendar are available options.

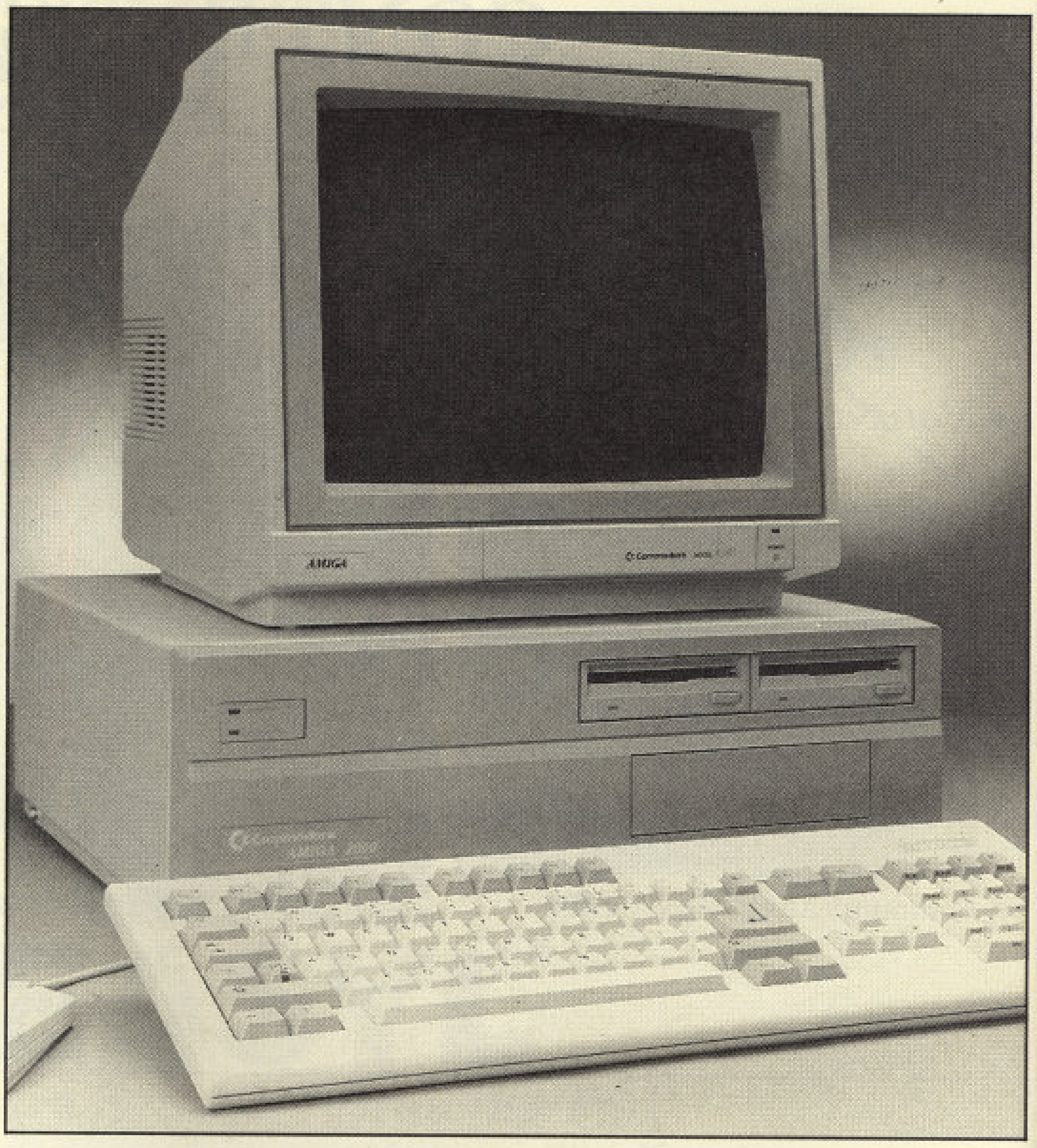
Release of the A500 will be in June at the Commodore Show. Price is £499 plus VAT and distribution will be through major retail outlets and independent computer stores.

And to Business

The A2000 is claimed by Commodore to possess unrivalled processing power and flexibility across the whole range of business computer applications.

For the first time the Intel and Motorola processing environments have been brought together in one machine, giving the user the benefit of running MS-DOS business software with the fast, powerful graphics-orientated 68000 environment in true multi-tasking mode.

Chris Kaday commented: "The reaction from the corporate market has been extremely encouraging as they have a growing need to add power and flexibility to desk top computing whilst retaining existing MS-DOS standards. The A2000 will be aimed at the existing markets on CadCam, process control, business presentations, communications and terminal emulation, whilst also establishing the new markets of desk top and interactive video which represent massive opportunities for Commodore as we are right at the start."



A2000

Specifications

The A2000 is based on the proven Motorola 68000 running at 7.14MHz supported by three co-processors, with 1MB of RAM which is internally expandable up to 9Mb. As standard, there are eight interfaces including serial and parallel ports and an interface for the detachable 94 key business keyboard. A mouse is included in all configuations.

Commodore (UK) will offer a number of configurations. Prices start at £1,095 (ex VAT) for an A2000 with single 3.5 inch 880K floppy drive, 1Mb of RAM, keyboard and mouse. An A2000M system with 1081 monitor costs £1,395 (ex VAT).

All of the componet elements of these systems are available as individual units. A 1081 monitor costs £349 and an A2088 PC bridgeboard costs £299.

Other A2000 system products include internal 5.25 inch and 3.5 inch floppy disk drives, internal 20Mb drive and 2Mb RAM board.

Touchline:
Commodore (UK): *Commodore House, The Switchback, Gardner Road, Maidenhead, Berks SL6 7XA.* ***Tel:*** *0628 770088.*

Amiga World

We bring you up to date on news, software and hardware for the Amiga.

Amiga Video Star

Increasing interest in the Amiga as a graphics workstation for the video industry, from weddings to Channel Four, has been refelcted in the rapid sales of the PAL Genlock system. Ariadne Software, which has developed the 'genlock', claims that the first 3000 rapidly sold out.

Managing Director David Parkinson is considering making a NTSC version for the USA. Companies are using *Delux Video* to create slide show and titling effects overlayed on to video frames. *Aegis Animator*, already used in the Disney School of Animation in Hollywood for teaching animation technique, takes the process a step further and makes the Amiga the prime source of footage!

A recent Horizon programme on BBC Television used the Amiga and Genlock to develop graphics to portray the structure of DNA while describing Darwin's theory of evolution.

The Genlock in question is the *A8600 PAL Video Controller* and it will set you back £430 plus VAT. It takes the Amiga and mixes it with an external video source. The source is used as the reference and the combined signal is redisplayed with the computer graphics superimposed on the video picture.

In default mode, the A6800 unit replaces the background and border colours on the Amiga display with the external video picture. Under software control colours other than the background can be replaced by the external picture. This allows transparent 'windows' to be created in the Amiga graphics.

The software which comes bundled with the A8600 is 'videoshow'. This allows control of the A8600 to be synchronised with the display of material from other software such as *Deluxe Paint*. It also provides for titling and simple animation.

Scientific Workstation

Commodore has successfully completed the development and testing of a RS232 to IEEE interface for the Amiga. The scientific laboratory, often home of the Commodore Pet (there are more than 10,000 in the field), can now benefit from the multitasking and graphics abilities of the Amiga. It can be integrated with spectrum analysers, network analysers, electronic balancers, multi-meters and high quality plotters to create a scientific test station. A complete Amiga/IEEE system costs £1,400.

Amiga Does the Business

Amongst new Amiga software launched at the Which? Computer Show was a selection aimed deliberately at potential business users. These included not only the standard packages but revolutionary combinations of Amiga with video and music.

On show were *Analyse*, claimed to be the fastest recalculating spreadsheet available, the *Scribble II* word processor and the *Organise database*. A 512K RAM pack, *Alegra*, can be added to the Amiga (it plugs on to the expansion bus) to allow the *Scribble, Organise, Analyse* trio to run simultaneously . The software allows some integration of data. The resultant 1Mb capacity system (hardware) costs £1,795.

Analyse incorporates the ability to quality-graph all data entered on a pie, bar, x-y or 3D chart, using up to eight colours. *Scribble II* allows the writer to edit four documents on the Amiga screen at once and to move between all four. *Organise* is the complementary database with easy form creation on screen, relational operation and data analysis.

Although the quality is high the Amiga cannot match the range of business software available for the ubiquitous PC. Therefore regular business users may prefer PC XT compatibility in the form of *Sidecar*. The Amiga/PC XT combination works out at £1,795 when bought from scratch. If you buy *sidecar* separately it will cost £699, making it £100 more expensive to add-on *Sidecar* for those already owning an Amiga 1000 system.

Pro Video Fonts 'n' Frames

JDK Images has produced the *Pro Video* CGI character generator for the Amiga. The developer is Jeff Karline, a professional with many years of experience in the cable television industry.

The three very attractive character sets are available in three sizes in NYSC interlace and 640 horizontal picture resolution. Eight colours can be used per page (from the full 4096 colours). There are selectable shadows, outlining, backgrounds, grids, underlining and flash. One hundred pages of text can be managed entirely in memory.

For the really professional touch, page transitions include rolls, wipes, reveals, slides, pulls, bang, fade and checkerboard with selectable speed and dwell. Alternative font sets are available on separate disks.

Desktop Video

Independent film makers Spafax Television and Triangle Television demonstarted at the Which? Computer Show both the use of the Amiga as a point of purchase video and, in association with interactive video, as a training device. Spafax combined Amiga, Phillips Laser-vision, touchscreen facility and specially developed software.

Triangle use the Amiga for superimposing graphics, titles, bar charts and pie charts on to video tape, mixing with frames from other sources such as video camera or laser disk. Triangle TV's Peter Barrett has expressed his enthusiasm about the professional results obtainable from the Amiga/Genlock system.

Amiga in Advertising

The Oslo branch of Ted Bates, the well-known television advertising agency, has opted for Amigas in its creative department. Per Berg, managing director, says "I see great possibilities for quicker development of ideas, and the prospect of speeding up decision making. We will be able to show the client combination and alternatives of form and colour, on the spot. The old dream of having the client as a member of the team will come closer than ever before." Advertising concepts and designs will be developed on the Amiga and trialled before commiting them to the final production stages.

Sidecar is a pretty hefty box containing the co-processor, 256K memory and 5.25" disk drive. Standard IBM expansion slots are also contained within. The software running on the co-processor is displayed in a window on the Amiga's monitor and it is perfectly possible to have both Amiga and *sidecar* processes running side by side. The *Sidecar* complements the Amiga beautifully. The creative computer now has a serious side for those whose creativity is their business. It remains to be seen what PC compatible software will run with *sidecar*. there is certainly plenty of powerful, and now relatively cheap, business software available. We will report back on our findings in *Your Amiga* later in the year.

Commodore certainly expect to make the Amiga a success in business markets. They announced that they had sold 150,000 Amigas worldwide in 'year one'. Chris Kaday, Commodore's Managing Director in the UK said "We entered 1987 with the Amiga selling across more applications areas than we believed possible. With more than 300 software packages now available for the Amiga, we have had a hard task choosing those to launch on our stand at the Which? Computer Show".

Snapshot

The Polaroid *Palette*, a system which allows photographs of the Amiga's screen display to be rapidly processed and displayed, has been implemented by HB Marketing.

Colour prints, 35mm slides or overhead transparencies can be produced for presentation alongside speeches, training talks and other presentations. The complete system, Amiga and *Palette*, starts at £2,885 plus VAT and it's being aimed at marketing services, financial planners and any audio visual organisation needing to reproduce computer generated designs.

The Amiga and *Palette* communicate via the *Liquid Light* interface which connects to the Amiga's video and RS232 outputs. It is possible to grab a colour, save it as a modified colour and then create a batch file for sequences of modified colours to be implemented across a collection of picture sets. It is possible to create cyan/magenta/yellow separation and edit each exposure for individual colour enhancement.

PCB Design

The £499 *PCLO* is a professional printed circuit design package for the Amiga which produces finished PCB artwork on a Houston Instruments or similar plotter. *PCLO* utilises libraries of designs which can be loaded and manipulated on both sides of a PCB. A high-speed routing alogorithm results in a real circuit trace that follows all the design rules, avoids any other subjects and follows the shortest path.

Amiga Reference Manuals

Addison Wesley publishes the official *Amiga Reference Manuals* produced in conjunction with Commodore and written by members of the Commodore Amiga team. There are four manuals on hardware, Intuition, ROM Kernal, Libraries and Devices and ROM Kernel, Exec.

A fairly high level of knowledge is assumed by the manuals but they are fascinating and very lucid descriptions of the Amiga system. The hardware manual is an overview of the graphics and audio hardware and the peripheral controllers. There are descriptions of the dedicated Copper (graphics coprocessor) and blitter chips. The depth of these manuals is shown by the eight appendices giving the entire register set and the uses of individual bits.

The Intuition guide is essential reading for the software writer who wishes to imbue his programs with the unique 'feel' of the Amiga, something which comes through the correct use of the Intuition user interface. There are full guidelines as well as a complete listing of the components of Intuition, specifications of data structures and function calls.

The ROM Kernel manuals deal in separate volumes with libraries and devices and Exec. The former contains vital insights into how to implement features such as graphics and animation, text fonts, audio and speech. Exec. is pulled apart with all the routines which support multi-processing listed out and described.

These manuals are excellently presented with clear layouts and text styles. Diagrams and example

programs in the C language are for the developer, computer science classroom and the dedicated home user, who will find some general introductions and principles as well as appendices packed with code. At £23.70 each (£33.20 for Libraries and Devices), these large format, thick volumes are good value. A particular interest, e.g. generating speech, can be quickly developed using the relevant manual and the complete set will prove an invaluable resource of information for the designer or programmer. If your local dealer doesn't have them in stock then they are available direct from Addison Wesley. Add £1.50 to cover postage and packing.

Business Updates

Following our look at *Superbase* in the last issue of *Your Amiga* I have been asked to point out that *Superbase* external files are files held for 'review purposes' and are linked to a co-incident database index. I don't think we made it clear enough that this is not an example of *Superbase*'s ability to extablish connections (relationships) with any file or combination of files within the database.

The news of Ariadne's SCSI/hard drive interface for £299 and their complete 20Mb hard disk system for £799 leads me to think that *Superbase* operating with hard disk could be very powerful core to the Amiga business system.

Logistix is now selling for £149 on the Amiga. Grafox has been encouraged by early sales to make the price drop. The PC version has also enjoyed a similar drop to £99. Is the Amiga version better by £50?

Metacomco Macros

The Bristol based writers of AmigaDOS, have announced a new 68000 Macro Assembler. Metacomco wrote the original *Amiga Assembler*, *Pascal Compiler* and *Cambridge Lisp* interpreter/compiler and supplied to to Commodore as software development languages for the launch of the Amiga.

The enhanced *Macro Assembler* boasts improved assembly speed and new feature including full macro expansion directives compatible with the Motorola specification. The software includes Linker, Amiga libraries, screen editor and manual. Price £69.97 ($99.95) inclusive.

Gimpel Software has introduced *Amiga-Lint*, a bug finder for C programmers. *Lint* is very fussy about C programs, much more so than a compiler and it can help make programs more efficient by identifying redundancy. Price $98.00.

Micro APL Ltd has launched the *APL 68000* for the Amiga – emulating IBM's V5APL. There's full interface to all the Amiga's graphics facilities and there are built-in VT100 APL/ASC II terminal emulations. The language runs in its own windows and debugs in another. APL 68000 is priced at £200.

High Level Ventures

Level 9 compilations *Silicon Dreams* and *Jewels of Darkness* are now available on the Rainbird label. At £19.95 they look very good value beside some of the imports. Each pack contains three full scale adventures on disk and a novella.

In the latest, *Silicon Dreams*, you play the part of Kim Kimberely in *Snowball*, *Return to Eden* and *The Worm in Paradise*. The trilogy boasts over 600 illustrations (not to the highest Amiga standards but not bad), over 13 million locations (still testing this claim), 1800 word vocabulary, new interpreter, multi-command sentences and multitasking (you can play two at once on a 512K Amiga).

Low Price Games

It had to happen. This spring should see the first release of budget software for the Amiga.

The software house behind the games is Anco and the first two to be released will be entitled *Space Battle* and *Demolition*. Both will cost £14.95.

How do I get it?

It's alright us giving you an exotic address and ZIP code for some Los Angeles neighbourhood but how do you get the software?

1. Check the ads – English Commodore dealers are importing more and more software all the time.
2. Try our contact addresses/telephone numbers.
3. Get in touch with Commodore UK who can supply you with a brochure full of goodies for your Amiga.

Touchline:

Commodore (UK): *Commodore House, The Switchback, Gardener Road, Maidenhead, Berks SL7 7XA.* ***Tel:*** *0628 770089.*
Addison Wesley: *Finchampstead Road, Wokingham, Berkshire RG11 2NX.*
Ariadne Software: *273 Kensal Road, London W10 5DB.* ***Tel:*** *01 960 0203.*
Cavendish Commodore Centre/UK Amiga Users Group: *66 London Road, Leicester LE2 OQD.* ***Tel: 0533 550993.***
Felsina Software: *3175 South Hoover Street, 275 Los Angeles CA 90007.*
Gimpel Software: *3207 Hogarth Lane, Collegeville, PA 19426.* ***Tel:*** *2155844261.*
HB Marketing Ltd: *Pier Road, North Felsham Trading Estate, Feltham, Middlesex TW14 OTT.* ***Tel: 01 844 1202.***
JDK Images: *2224 East 86 Street, Suite 14, Bloomington, Minnesota 55240.* ***Tel:*** *612 854 7793.*
Kuma Computers Ltd: *Pangbourne, Berkshire, England.* ***Tel:*** *07357 4335.*
Meridian Software: *P.O. Box 890408, Houston TX 77289 0408.* ***Tel:*** *(713) 488 2144 (USA).*
Metacomco: *26 Portland Squarae, Bristol BS2 8RZ.*
MicroEd: *P.O. Box 444005, Eden Prairie, Minnesota 55344.* ***Tel:*** *612 944 8750.*
Precision Software: *6 Park Terrace, Worcester Park, Surrey KT4 7JZ.* ***Tel:*** *01 330 7166.*
Rainbird Software: *74 New Oxford Street, London WC1A 1PS.* ***Tel:*** *01 240 8838.*
Viza Software: *Chatham House, 14 New Road, Chatham, Kent ME4 4QR.* ***Tel:*** *0634 45002.*
Y2 Computing Ltd: *Tarmey House, 146-150 St. Albans Rd, Watford WD2 4AE.* ***Tel:*** *0923 50161.*
Club Amiga: *85 Upper Drumcondra Road, Dublin, Ireland.*
Independent Commodore Products Users Group: *57 Gunnersbury Avenue, Ealing, London W5 4LP.* ***Tel:*** *01 993 2634.*
Local Commodore Business Centre: *0536 205555.*
High Voltage: *53-59 High Street, Croyden, Surrey CRO 1QD.* ***Tel:*** *01681 3022.*
AB Computers: *173 Thornbury Road, Osterley, Isleworth, Middlesex TW7 4QG.* ***Tel:*** *01 568 7149.*
Computatill Ltd: *77/79 Chadderton Way, Oldham OL9 6DH.* ***Tel: 061 652 8006.***

Shell

Find out how Metacomco's Shell stood the test of an intensive review.

By Anne Owen

The twin features of friendliness and power attributed to the Amiga have not deterred software designers from coming up with additional and alternative 'user interfaces'. Metacomco's *Shell* is an enhanced version of the CLI, the command line interface which takes commands from the keyboard and interprets them into actions taken by the Amiga Disk Operating System.

Shell Shock

Metacomco's people are 'insiders' as far as the Amiga is concerned since they supplied Commodore with AmigaDOS, the multiprocessing disk operating system which lies at the heart of the computer. Their products therefore can be expected to engage comfortably and correctly with the resident Amiga software.

This is very much the case with Metacomco's £49.95 *Shell*. *Shell* is installed on the Workbench disk, in the SYSTEM drawer and its attractive icon (put your ear to it and you can almost hear the sea!) will pop up next to the CLI when the SYSTEM drawer is double clicked. *Shell* works with Workbench V1.1 and V1.2. A patch is provided for V1.1 which is transferred automatically when *Shell* is copied via the RAM disk.

When activated, the *Shell* opens TASK 1 and draws a window in which to work. *Shell* is a new working environment, a version of CLI which offers more control over the operations carried out by AmigaDOS, such as copying files, sending files to devices (printer, RAM disk, serial port etc.) and cataloguing a disk. The full set of new features is shown in the 'help screen'.



Command Line Contrast

Compared to many 'lesser' systems, the standard Amiga CLI insists on such sophisticated actions as retyping every command line and deleting to correct back along a command line (cursor keys), deletion and insertion of characters. Pressing RETURN at any time activates the command, you don't have to have the cursor at the end of the line.

As you enter a command, *Shell* not only executes it, it also helpfully 'remembers' the commands typed in. This is the HISTORY feature. You can tell it how many commands to remember but it starts with 10. The archived commands are held in a numbered list. You can move up and down the list with the up and down cursor keys or retrieve a command line from the list for editing with these three keystrokes: '!, number in list and ESCAPE.' If you just want to activate the numbered command, these keystrokes will do: '!, number in list and RETURN'. '!! RETURN' activates the last command typed.

Let's just give a brief example. Suppose you execute the following sequence of commands:

copy desktop/banners/xtra to df1:desktop/newspaper

key 6 copy* to PRT:

then type 'history'. The following will be printed on screen:

1 copy desktop/banners/xtra to df1:desktop/newspaper

2 key 6 copy * to PRT:

Now type !1 and RETURN and command 1 is executed again. Typing !2 and ESCAPE will redisplay command 2 for editing. Which brings us to function key definition.

At Your Convenience

Shell lets you define the function keys with the KEY command. Typing KEY along gives you a display of the current definitions. A definition may contain the '^M' combination (which represents a press of the RETURN key) at the end of a line. Thus a key definition such as 'key 3 assem window.asm -o window. o ^ m' enables the sequence to be executed with a single key press.

A further invaluable new command is RESIDENT, which transfers AmigaDOS commands such as COPY or DIR into memory. Normally such a command is read from disk, executed and discarded. Having just a few commands resident can save a lot of disk swapping and makes a single disk system almost usable! One DOS command which is always resident in *Shell* is CD.

PUSH and POP are new commands which make using directories easier. An AmigaDOS disk can hold up to 9000,000 bytes of data and often multiple directories are setup to keep files in a managaeable form. Thus two directories on a disk can end up some distance from each other in the directory 'tree'. Using PUSH and POP you can switch between two directories without having to type the complete pathnames. PUSH moves you into the specified directory and remembers whence you came. Issuing a POP command takes you back to the remembered directory but without recalling where it's come from. Issuing PUSH again on its own returns to the rememberd directory, again remembering its start point.

Paths, Aliases and Variables

For the programmer, *Shell* adds a number of useful features to the CLI. The PATH command redefines the sequence of directories in which the system looks for a command file. Normally it will look in the current directory and then the C (command) directory. So if you have a utilities directory you can add it to the search path. This means that you can just type the utility name and not worry about the rest of the pathname.

An alias is an alternative name for any string you care to give it to. The simply syntax is ALIAS < aliasname > < actual name >. For instance ALIAS c compilation. It is a nickname or short form. If you can't remember what allocations you've made then typing ALIAS on its own reminds you.

Aliases can only be used as the first thing on a command line and cannot contain spaces or tabs in their definitions. Variables are much more flexible. Any part of a command line may be assigned to a variable with the command SET. Let's give an example:

alias c copy

set t df1:textfiles/letters

set df1:asciifiles

will allow you to use the shortened command line

c $t $a

to perform

copy df1:textfiles/letters df1:asciifiles

The '$' character points the *Shell* in the direction of a variable. If you now type:

set b c $t Sa

then b is defined in terms of the other variables and now represents the entire line. Just type $b to execute. Individual variables can be redefined at any stage. For instance:

set a df0:asciifiles

would now redefine the a element in b. b now equals:

copy df1:textfiles/letters df0:asciifiles

The command EQU does the same as SET but defines a variable in terms of another using that variable's current definition. Any subsequent change to that variable will not change that set by EQU.

Shell Summed Up

The need for a brand new editor should not be underestimated. Coming to the CLI of the Amiga from any modern eight bit computer can be a frustrating business – no wonder that it's initially 'hidden' from the user. The main limitation is the user's inability to edit or copy commands already typed in. This leads to repeat typing, highly undesirable when large pathnames are involved. There are limited and inflexible ways to cut down the length of what you have to type but the abbreviations circumvent the system's positive ability to maintain long, meaninful filenames. *Shell* can promptly snap you out of this non-typist's nightmare.

The £49.95 price tag is justified by the overall excellence of the product. The manual is over 100 pages of clearly written text with plenty of examples. The large selection on CLI (1.2) commands is added value for those without a CLI reference work. There is a 'quick reference' appendix on the *Shell*-only commands and an index.

The new command editor lets you freely enter a command and its parameters and combines with the other extended features to make *Shell* easy to use, an important contribution for the general Amiga user. For the software developer, *Shell* means higher productivity and the keyboard. Of these increases in ease of use and productivity you can be sure, with *Shell*!

Amiga Agony

If you have any technical problems concerning Amiga hardware or software, then write in to this page and our teams of experts will straighten you out.

Deluxe Problem

Until recently, I have been using my Amiga with version 1.1 of both Kickstart and Workbench. In America however, I purchased a copy of a new art program called *Deluxe Paint II*, only to return home and find that it would not work correctly with my version of Kickstart. Help! I have spoken to my dealer who says it is because the program is American, is this right?
David Sands, London.

No. The reason Deluxe Paint II will not work is because it was designed to use the newest, version 1.2 of Kickstart. As all software will in the future be designed to use this system, it would be advisable for you to go to your dealer and TELL him to get your disks updated to the new versions of both Kickstart and Workbench.

Transformations

A friend of mine recently sold me his Amiga which he imported personally from America in early 1986. Although it works perfectly, I still have to use a transformer to run the machine on 240v. As yet I have not found any software that will refuse to run on my machine, and last week I was sent copies of 1.2 Workbench and Kickstart, which work perfectly. My question is two-fold.

Firstly, can I upgrade my computer to British PAL standards, so that I can then use a Gen-lock system? And secondly, what are the main differences between versions 1.1 and 1.2 of Kickstart and Workbench?
P. Taylor, Camberley

To start with, yes you can upgrade your machine, although it will be necessary to ask your local dealer to get the chips and, unless you feel very confident, to fit them too. Once the chips and power supply have been changed, you will have a completely compatible UK Amiga.

As for the differences between versions 1.1 and 1.2 they are basically chalk and cheese. 1.2 Kickstart no longer lets the Amiga crash at the slightest provocation, and is essential for using on a PAL system, 1.2 also allows the Amiga to auto-configure itself for extra RAM, allowing up to eight megabytes at once. For people used to 1.1 the most noticeable difference will be in the speed and quietness of the disk drives, which are now a quite fast and much less noisy.

There are also differences in the Workbench software provided with the machine. The Preference is much more complete, with an extended list of compatible printers, and there are a couple of other small additions.

Disk Size?

Unlike most of the people who purchase Amigas, I use mine as a business machine (although I do of course enjoy the other facilities it provides). When I bought the machine I was told that, when I wanted to, I could attach a 5.25" disk drive, and convert my IBM PC files to Amiga format.

Recently I have been working more from home and would like this facility, do I need software as well as the drive?
M. Street, Stevenage.

There are two completely different solutions to your problem, and they both achieve a similar end: allowing you various degrees of PC comptability. The first way to solve your problem would be to buy a piece of hardware produced by Commodore called the Sidecar. This is a large box that plugs into the side of the Amiga, and comes with a built in 5.25" drive and a 8088 processor.

Basically the Sidecar acts as a completely stand alone MS DOS machine, that uses the Amiga as an Input/output system. In MS DOS mode, the Sidecar allows the Amiga to run almost any IBM software, although you do lose the obvious advantages of the Amiga's multi-tasking operating system.

The other alternative is to purchase a standard 1090 5.25" disk drive, and some software called Transformer. This allows the Amiga's 68000 processor to emulate the 8088 processor, and run a limited amount of PC software (including certain versions of Wordstar and Lotus 123), and to transfer data files into Amiga format. It really depends how much compatability you need. If you want to bring your own software home, the Sidecar is for you. If all you want to do is bring some data home, and then port in into, for example, Logistix, then Transformer would do the job perfectly.

Word Pro Problems

When I bought my Amiga, I also bought a word-processing package from Commodore called *Textcraft*. At work I use it with an Epson FX100, and at home I use an FX80, unfortunately, I have found a number of problems that spoil this otherwise excellent piece of software.

Firstly, and most importantly, when I try and print any document, all my pages are preceded by a random letter (generally a W), this is both

annoying and time consuming as I then have to white out each letter. Secondly, if I use *Textcraft* from the second disk drive, it sometimes hangs, without warning, meaning I have to reset my computer before I can continue.

Any help you can give would be appreciated.

D.Catlin, Inverness.

Unfortunately the printing problem is a well known bug in version 1 of Textcraft. To remove the random letter, you must use the **Generic** *setting in your Preference, but unfortunately this then means that you cannot use any special typestyles! The hanging is also a result of the early version of Textcraft you are using, but it can be avoided by creating a start of day disk, and being careful to erase any files you do not need. As long as you keep this up, you will have no problems.*

Thankfully, Commodore has promised that there is a new and bug-free version of Textcraft on the way, although no one is sure when. Alternatively you could use Scribble which, as far as I know, has none of these type of problems.

Mathematical Speed

As a maths tutor, I have been very impressed at the capabilities of the Amiga as a workhorse for jobs such a number crunching and the creation of Fractal graphics and Mandelbrots.

My only qualm is that the 68000 processor is a little slow for these purposes, especially when the programs have been written in a language such as C.

Is there any way of speeding up the processor?

Professor B.McGrath, Hull.

To be honest, any noticeable speed increase will cost a great deal of money, but if you have the funds, there are three different processors that would achieve the desired results. A 68010 or 68020 processor, to replace the standard 68,000, would certainly nmake a speed difference, making the machine between 10% and 30% faster. If your interest is only in maths, then a 68881 co-processor, to work in tandem with the standard 68000 would probably achieve the most noticeable speed improvement.

Constant Kickstart

As with many other Amiga users that I know, I am becoming more and more tired of having to boot my Amiga with Kickstart every time I wish to use it.

I understand that now Kickstart 1.2 is totally stable, Commodore has decided to install it in ROM in the newest machines, the A500 and A2500. Is there any way I can get Kickstart on ROM for my A1000?

P. Summers, Hackney.

Until recently, the answer to this question would have been no, but last week I heard that a company in America has started doing just that. Even more exciting is that, as the company puts Kickstart 1.2 on to 256k ROM, the user has 256k of extra FastRAM that can be used for purposes such as a RAM disk. At the time of press, there were no details of price or availability, but watch this space. YC

Amiga On Line

Communications is fast becoming one of the most popular computer applications. Not to be left out, Felsina sofware has come up with A-Talk for the Amiga.

By Anne Owen

Already the Amiga has made its mark in the fast-growing world of microcomputer communications. One of the earliest sale successes was at Micronet, the on-line magazine on Prestel. Staff at Micronet are looking forward to taking delivery of their Amigas which they will use as teletext editing workstations. Y2 Computing are writing the software, *Ruby Review*.

Bulletin boards are already embracing the Amiga and AUG (Amiga Users Group) has set up its own information board. Cavendish Computers are offering an Amiga/WS4000 combination and membership of the bulletin board for an all-in price.

From the United States comes software packages like Maxi-comm, *Online!* and Commodore's own *Amigaterm*. And a powerful new challenger for your foreign money order is *A-Talk*. The publishers, Felsina Software, develop some strong arguments about why *A-Talk* is your best bet for comms software. *A-Talk* certainly has a wide range of abilities.

Dialup

A-Talk's screen and user interface is built around the familiar pull-down menus which take care of operations under the headings Project, File, Xmodem, Kermit, Set and Dial. You can set up baud rate from 300 (some bulletin boards) to 9600 (computer to computer). There is control of parity, stop bits, seven or eight bit word, handshaking (Xon/Xoff), protocol, half or full duplex. The dial menu is for selecting modem and telephone type, and number of automatic redials and whether your modem can automatically hangup.

Depending on your modem, dialling up and logging in can be made incredibly easy with *A-Talk*. Dialling can be automatic from a 'glorified telephone directory'. Up to 10 different regulars can be stored alongside a login script — a disk based textfile containing your side of the dialogue which takes place with the host computer when you ring up. A log in script can contain commands such as WAIT, DELAY, TIMEOUT, and SAY.

One of the proud boasts of *A-Talk* is that is supports ordinary ASCII file transfer, XMODEM error checking transfer and KERMIT error checking transfer. The first of these can be used to send messages and unimportant data. The two latter protocols are the most popular for sending binary files and important text files from computer over the telephone. The *A-Talk* XMODEM option automatically chops binary files (removes the padding). All modes aid the user with prompts and status information on the screen.

A-Talk supports a number of screen terminal types, ANSI 77x23, 80x23 and 132 character per line. You can configure for working with UNIX systems. It supports VT100 escape sequen-ces, VT52, H19, ANSI and TTY, and can work with vi, emacs and EDT VT100 editors.

Hang Up

A-Talk also has a voice option which can be used to alert the user to a successful logging-on or can enunciate the morning's e-mail messages. There is also a 'bell' and visual 'flash'which can be used as an alarm to alert the user to a completed operation.

The *A-Talk* manual is very helpful and combines with examples of all the features on disk. These tend to be specifically American but give an idea of what is needed for the UK equivalent. Certainly if you are regularly logging on to services in the USA, *A-Talk* could prove very useful. *A-Talk* is admirably programmable so it is possible to leave the Amiga to carry out a simply logon, send or retrieve, logoff operation all by itself.

The manual also provides handy hints on what other computers will expect by way of linefeeds and special characters and there's a step by step guide to linking an IBM and an Amiga for direct data transfer.

Some features of *A-Talk* are available in public domain and commercial software but nowhere in those I have seen (*Starterm, Online,* and *Amigaterm*), have they been combined so powerfully. The enjoyable manual and the offer of updates and support allow me to highly recommend *A-Talk* to Amiga communicators.

An *A-Talk Plus* is already in store with support for Tektronix 4010/4014 graphics emulation. Graphics produced on screen can be printed to any Workbench 1.2 supported printer or saved to IFF files. The standard screen can also be changed to 700 by 440 pixels for additional resolution. Price $99.95.

Touchline
Name: *A-Talk.* ***Price:*** *$49.95.* ***Machine:*** *Amiga.* ***Supplier:*** *Felsina Software.*

The Painting Corner

The forte of the Amiga is undoubtedly its graphics capabilities. A variety of packages are now available, but how do you make a choice?

By Anne Owen

Going into graphics? With the Amiga you've chosen the right computer. A number of software packages are now available to exploit the Amiga's excellent display and graphics handling.

Print Shop

When it comes to using your Amiga at home to create printed stationery, greeting cards, posters or labels then there are two very evenly matched contenders: *Printmaster Plus* and *Deluxe Print* are the two currently available software packages. The former is black and white only, the latter colour.

This fundamental difference may take your selection for you because if you don't have a colour printer then pure black and white printouts are more effective than grey shades. Of course, in Deluxe Paint you can restrict yourself to just black and white, or force black and white printouts via Preferences. If you have a colour printer then make sure that you take full advantage with the 16 colours (of 4096) of *Deluxe Print*. It is possible to come up with the most attractive finished product. *Printmaster Plus* offers: Sign, Stationery, Greeting Card, Banner, Calendar.

Deluxe Print offers: Sign, Banner, Letterhead, Calendar, Greeting card, 4-tile sign.

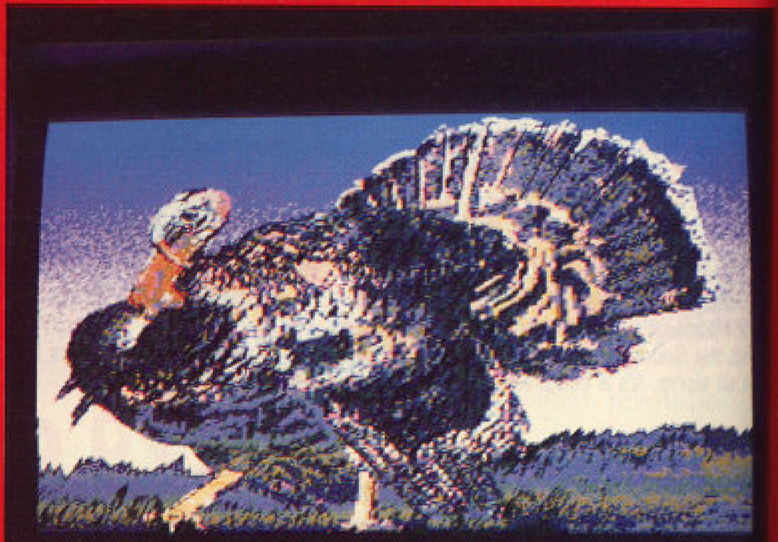
Deluxe Print is much more efficient in the creation department, displaying both artwork and functions on-screen. Clip art is loaded from disk and can be sized and moved around the chosen paper size.

Printmaster takes the user through a sequence of bare menus. The artwork is not present on screen until the final preview stage, not an ideal situation but manageable. *Printmaster* offers only restricted placement of graphics and text, *Deluxe Print* is much more flexible in this respect with 'moving' and copying around the artwork, be it label or poster sized. *Printmaster* has the greater range of 'graphics' – small pictures sometimes called 'clip art' which form the equivalent of a designer's artbook.

The subject matter covered ranges from romance – hearts, cupids – to modes of transport – ships, cars, buses, trai *Printmaster* has the slightly more detailed graphics, *Delu Print* is strong on word bubbles, pointers and 'signs'. *Delu Print* also has a better range of borders but *Printmaster* wi out with some lovely text fonts (*Deluxe Print* only uses t standard Amiga fonts). Finally *Printmaster* lets you desi your own graphics. The editor works but, in Amiga terms, difficult to use.

If you want to take things further than your 'domesti needs then a full drawing package perhaps with the ability scale for the printer and accompanied by some mo sophisticated clip art is recommended.

Of the two print packages reviewed here, *Deluxe Print* much nicer to use and, if you are willing to add extra disks clip-art you won't find many subject areas not covered. It al has the ability to export and import graphic data which mea that it is the ideal companion for the other packages in t *Deluxe* series. *Printmaster* offers more graphics to start wi (there are also further clip-art disks) and the ability to desi your own. It is let down by its user interface, certainly not its results on paper.



Even More Deluxe

It is claimed that *Deluxe Paint* achieved 50% penetration of Amiga users and, if true, that would certainly be deserved. Users of all levels of artistic ability have enjoyed the easy to use but powerful features.

And now, *Deluxe Paint II* is launched. There's no word of an upgrade policy which seems a shame, especially at the asking price.

The professional user will probably have to have it. For the home user it's a bit steep but nevertheless, if graphics is your interest, justifies the whole system, computer and software.

Certainly from what we've now seen *Deluxe Paint II* is unrivalled. More than 50 new features have been added. It is claimed to be 20% faster. Its creator, Dan Silva, believes the flashiest new feature is perspective mapping and perspective fill. He says "Dpaint 2 actually let you move a brush around in three dimensions and construct three dimensional space grids based on a brush painted in tow dimensions. We've also added the ability to fill infinite surfaces with a tile pattern of a brush seen in perspective. Another new feature, Anit-alias, allows clean up of the brushed image to eliminate jagged edges and distortion that result when the brush is rotated or bent."

One of the nicest additions is the stencil which allows the artist to define areas of the screen in which the pixels are locked, as if a transparent stencil was over them. In this way precise areas can be filled. Another feature, 'fixed background', is analagousto fixative sprayed over a conventional painting. A fixed background cannot be altered but it is possible to paint on top, scrape things off, pick things up and move them to a different position with the fixative always preserving the underlying painting.

In One End

Professional computer artists use a wide variety of tools to enable them to practice their trade successfully. Like the conventional artist they will try anything to get the required effect. However some input devides are preferred over others and used much more often.

The mainstay input device of the computer artist is the graphics tablet. It represents the nearest equivalent of putting pen to paper or brush to canvas. Anakin Research of Toronto, Canada – a hotbed of Amiga users – has designed such a tablet for the Amiga. It's called *Easyl*.

The *Easyl* graphics pad connects via its own interface box of the Amiga's expansion bus. A 'through socket' makes the bus available to other devices. It's a good firm fit but I wondered why, when all the other Amiga ports have splendid screw-secured connectors, you cannot further support devices on the expansion bus. Not *Easyl*'s fault and I foresee no problems with this design. A cable connects the interfce to the pad.

Any blunt instrument can be used on the 'rubbery' surface of the pad – is in fact a special durable plastic designed for easy maintenance. The pad is sensitive to the touch and the software computes the position of the point of impact, a bit like calculating a map reference. The pad is pretty sensitive but needs a consistently firm pressure.

Experimenting with the art of software packaged with the



pad is a good way of getting used to what is needed. The controlling software reacts pretty quickly but there is a small delay between applying pressure and the effect occurring on screen. This is so small as to be insignificant in most circumstances. Only when you draw a long line at speed, for instance, do you notice the delay on screen.

In buying the *Easyl* package, including pad and software, you are getting a complete setup for creating pictures on your Amiga.

The art program supplied on the *Easyl* disk is especially designed to take advantage of the high co-ordinate capture rate of the pad, some 250 co-ordinate pairs a second. You can work in any resolution. The pull-down menus can still be operated via the mouse if you wish, leaving the drawing to artist and *Easyl*. In landscape mode the aspect ratios of the Amiga screen and the surface of the pad are virtually identical. In portrait mode only some of the screen is used.

Drawings from *Easyl* can be saved in LFF format for loading into other software. Indeed this is vital if you want to print out the drawing because there is no screen printer built-in. One-touch commands include Fill, Keep, Restore and Clear. A set of brushes increases the artist's options since adjacent sampled points will always be joined up. Thinning mode avoids clustering when drawing slowly. Direct mode switches off the above two software control features.

Extension Drivers

If you wish to extend the power of your graphics software you may do so trhough the use of software drivers supplied for installation on *Aegis Images* and *Deluxe Paint* disks. The drivers enable the soft ware to be used in conjunction with the pad and there is one for both left and right handed users. The menu options which appear on-screen can be reproduced with overlays (though none are provided) and the twin red and white buttons on the pad form the equivalent of the mouse right and left buttons.

Deluxe Paint features such as Fill, Brush and magnify actually become easier to use. Full instructions for installation and correct configuration are in the manual. *Easyl* 1.2 for use with AmigaDos 1.2 will work well with *Aegis Draw* and *Aegis Animator* as well. *Aegis Draw* is a particularly powerful drawing package with scaling, multiple level zooming and the ability to work on two drawings at once. It is intended for

commercial line drawing applications and a graphics pad is the ideal input device.

Easyl extends the range of the computer artist, enabling he or she to take full advantage of powerful features in the currently available software. Tracing pictures on the pad can result in very detailed reproduction. Fine editing of pictures at pixel level is also much easier. A further application in which *Easyl* has proved revolutionary is in the area of animation. The skill of the anumator can be transferred directly onto the screen and thence onto video tape. Bey tracing on paper on top of the pad an image can be perfected and then transferred via harder pressure on to the screen. The images are created one by one, each one the equivalent of a video frame. An 'animation peg bar' can be fitted to the pad.

The *Easyl* package is completed by an excellent manual packed with step by step instructions for non-specialists and hardware details for engineers. A larger chapter is devoted to the supplied C language and 68000 assembler files which are supplied on the EASYL disc. This information will help software developers rejug the software for specific applications.

EASYL

Beyond the obvious artistic applications of *Easyl* – both commercial and for art's sake – there are other uses to which the pad can be put.

It is an input device suited to young children or handicapped people of all ages. It is sensitive enough to react to gentle but firm pressure and printed overlays taped to it ca be made to correspond to the screen layout. The Amiga ability to pop up requesters, yes/no prompt and highlighte menu options offers great potential in league with the tabl for those who cannot handle a keyboard or mouse. It's th next best thing to a touchscreen, more accurate and less pron to confusion.

As a graphics input device *Easyl* has no peers at the pric It's a neat design, appears very robust in construction an likely to last the vigorous use to which it will undoubtedly b put. Make space on your desk for an *Easyl* if you possibly ca

And Out The Other

Three colour printers are now being offered by Commodor to try to reproduce the Amiga's beautiful screen display a hardcopy. For the commercial user there's the Mitsubishi 50 thermal printer. This is being offerd to the reprographic trad as part of an Amiga workstation and need not worry the hom user.

The Xerox 4020 is priced for the business user at £1,19 It's a colour ink jet and the results are remarkably good capturing most of the subtlety of colours possible on th Amiga screen. You won't be disappointed in its performanc if you are serious about reproducing graphics on paper.

Running costs should be manageable with a single colou ink replacement pack costing around £9.00.

At £288.08 the Quadram Quadjet ink jet colour printe completes the range.

Amiga Basic: an Overview

Getting to grips with a new Basic can be a daunting prospect. Here we try and help you on your way.

By L.K. Gibson

The Basic supplied with the Amiga was written by Microsoft and is a variant of the standard Basic found on many eight bit and 16 bit machines. The Basic carries all of the features of standard Microsoft Basic but has enhancements to make use of the Amiga's extra facilities. Unfortunately not all of these are accessible through Basic. One of the major disappointments in this area are the sound commands, more about this later.

Most users that buy an Amiga will be familiar with Basic from a previous computer. Even though the dialect may be different, there will be many similarities where there is only a need to learn the new syntax.

The second advantage is that Basic is supplied with the Amiga. It is therefore very accessible at no extra cost, and should you come up with a chart topping blockbuster you know that your prospective buyers will be able to run your program with no problems.

Another advantage is speed. Ideally, for programs to execute at speeds required for complex graphics etc., C or an assembler are the obvious choices. But remember, most users will be used to seeing Basic on eight bit machines and believe me Basic on the Amiga is another beast altogether, and if used properly can equal or beat eight bitters running machine code!

Amiga Basic also has some fairly advanced functions. An example of this is the CALL command which allows you to call machine code routines written in assembler language or C. This allows you to develop at a nice pace starting off with just Basic.

The CALL command also allows you to access some of the commands in the system Libraries – e.g. the graphics library – which are a definite requirement for any serious programming.

We all know by now that every dialect of Basic supports various standard Basic commands such as FOR, NEXT, PRINT etc. It is pointless to spend any more time on these than simply to say that they exist within Amiga Basic. What I will discuss are the commands that are slightly more peculiar to Amiga Basic or non standard to some other dialects of Basic, beginning with graphics.

Areafill

This command is a very fast polygon drawing routine and incorporates a fill routine. It uses a call to the graphics library function AREAFILL and can be used with a pattern fill also.

Circle

This command allows various parameters dictating the circle included are centre position, radius, colour and aspect ratio. In version 1.1 of Workbench (Intuition) there is no Circle function in the graphics library. This is therefore implemented by Microsoft's own developers. Note that verion 1.2 of Workbench (Intuition) does have a circle function, but unless Amiga Basic is released in a new version this will not be utilised from Basic.

Get and Put

This command allows bit map info from the screen to be picked up in an array and be redrawn using PUT in another area or on a different screen. It is very fast and can produce some stunning graphics if utilised properly. There are various graphics library functions that could perform this operation and I don't know which ones were employed but I would hazard a guess at BltBitMap which copies sections of Screens bitmap (images) from one location to another using the systems hardware Blitter chip.

Line

This will draw lines or boxes which can be filled using the Move and Draw commands.

Objects

There are various Basic commands that can be used for the animation of graphic objects. These include OBJECT.AX, OBJECT.AY, OBJECT.CLIP, OBJECT.CLOSE, OBJECT.HIT, and OBJECT.ON.

Paint

This command fills an area with colour up to an enclosed boundary. All you have to do is specify any x/y coordinate within the shape and the colour to be used. This command uses a call to the graphics library function Flood.

Pattern

This allows users to define the patterns for lines, text and paint operations.

PSet and Point

I have grouped these commands together because they are complementary functions. PSET allows you to set any point on the graphics screen and POINT allows you to read the current colour of any pixel on a graphics screen. The graphics library calls for these functions WritePixel and ReadPixel respectively.

Screen and Window

These two commands produce a screen, according to various limitations, which can be in any of the standard Amiga resolutions including Interlace (400 Pixel vertical resolution). The user must then create a window in which to draw. The window can be any size within the screen limitations and be rendered with or without system window gadgets. Note that the standard Amiga Basic screen and window can be used (640*200 resolution) but the limitation is four colours (two bitplanes deep), so for any serious graphics a new screen and window have to be created using the above commands.

Scroll

This command allows a rectangle of almost any size to be scrolled in any direction. The command is limited by the fact that, as the defined rectangle is moved, it wipes out any background data it touches and replaces it with the background colour.

That concludes the discussion on some of the more unusual graphics commands, remember that not all of the graphics commands are listed here. Now I'll take a brief look at sound and speech commands.

Sound

This command is the mainstay of sound in Amiga Basic, allowing simple sounds to be produced on any of the Amiga four sound channels. Parameters that can be set using the SOUND command are Frequency, Duration, Volume and Voice (Channel) Number. The default waveform for the SOUND command is a Sine wave but this can be altered using the WAVE command.

Wave

When a sound is played on the Amiga, the shape of the sound is taken from a Waveform defined in memory. This waveform defines a sound envelope and controls the type of sound produced. The shape of the waveform can be changed using the WAVE command, this gives the effect of altering the type of sounds produced with the SOUND command. The waveform that you define is passed from an array, containing at least 256 numbers between −128 and 127, to the WAVE command. This new waveform is then valid for the voice which you specify. Please note, waveforms are put into the system memory so, when they are no longer needed, the memory should be cleared using the ERASE command.

BEEP

This command is probably the most limited of all the sound commands (which are in themselves limited). When this command is issued within a program there is a single audible beep and the screen flashes once. Note that there is a bug in the BEEP command. See the later section on bugs for a definition of this.

SAY

The SAY command takes a string of phonetic codes and speaks them according to a predefined array of parameters. The parameters array includes definitions for Pitch, Inflection, Speech Rate, Male or Female Voice, Tuning, Volume, Channel, Mode and Control. Most of these parameters are self-explanatory apart from the last two. Mode allows you to set Synchronous or Asynchronous speech. Control gives control over speech interruption when Mode is set to Asynchronous.

TRANSLATE■

This is a very useful command since it will convert ordinary English text into Phonetic codes for use with the SAY command. This makes life easier, but some control over the speech is lost, because the translator library, although very good, is sometimes inaccurate. Also the Translator library will give your speech an American accent. Using SAY with Phonetic code will overcome this.

That concludes the Sound and Speech commands, and unlike the graphics commands, they are all listed above. As you can see, although speech is pretty well covered, Amiga Basic lacks in the sound department.

Data Files

Amiga Basic can handle two types of data file namely RANDOM and SEQUENTIAL. These are very easy to set up and use.

SEQUENTIAL

These files are easier to use than Random files but are also slightly more limited and slower. This is due to the fact that data is stored as ASCII characters. In order to access the Nth piece of data, characters zero to N must be read first.

Sequential files must first be opened with a mode specifier. This can be Read, Write or Append. You cannot open a sequential to Read and Write at the same time. The file must first be closed and re-opened. If a Sequential file containing data is opened with a Write mode specifier instead of an Amend mode specifier, then all data in the file is lost.

An optional parameter, that can be specified in the Open command, is the Buffer size. This tells the computer how many characters to Read in or Write out in one go. The default for this is 128 Bytes but this can be decreased or increased as desired. Increasing the buffer size speeds up file I/O but makes heavier demands on memory, so, obviously, users must reach a happy compromise.

RANDOM

Random files are slightly more cumbersome to set up and use than Sequential files but the benefits attained may well make the extra work worthwhile. Amiga Basic Random files are very fast and are accessed via their records number.

The Amiga Basic manual's coverage of the commands are interchangeable between the two data formats, often only requiring different parameters.

EVENT TRAPPING

Event trapping is a means of creating the impression of two simultaneous operations. Certain events in Amiga Basic can be trapped and a specific routine can be jumped to for servicing the event. The program flow is then passed back to the stage previous to the event trap. The most common trap, also found on many other computers, is ON ERROR, whereby, if an error condition occurs within the program, an error routine is executed and then the program is either terminated or re-started depending on the nature of the error.

Amiga Basic supports a wider range of Event trapping than most Basics and can trap events for TIMER, MENU, MOUSE, ERROR and competitors because some of the techniques achieved with event trapping are not possible in standard Basics.

Event trapping is very easy to initiate and use, firstly the user must build a routine that is going to handle any given event. This just takes the form of a standard subroutine. An example is to decrement an on screen timer every second. The routine will purely decrement the screen display. There is no need for any event checks because this routine will be called only on the timer trap. Next we must activate Timer event trapping, this is accomplished by issuing a TIMER ON Command.

We now have to tell Amiga Basic where we want to go and on which event. Easy, we just say: ON TIMER (1) GOSUB Routinename. This will execute our subroutine called Routinename once every second from now on or until event trapping is switched off with ON TIMER (1) GOSUB 0. An ON EVENT GOSUM 0 stops event trapping for the EVENT specified.

MOUSE

This traps the user when the left mouse button is pressed and is activated by MOUSE ON:ON MOUSE (0) GOSUM Routinename. This type of event trapping is useful for on screen mouse selections.

MENU

Providing you have set up menus using Amiga Basic's MENU command this event traps the user pressing the right mouse button and selecting a menu option. Pull down menus should be used whenever possible as this gives your program professionalism and user friendliness.

Menu trapping is initiated with ON MENU:ONMENU GOSUB Routinename. Interrogating menu selections is fairly straightforward. The Menu Number selected is held in MenuId and the MenuItem selected is found in the MenuItem variable. In the case of Menu trapping the Routinename in ON MENU GOSUB will be a subroutine to decipher which menu and menitem was selected and then executing another subroutine according to that selection.

BREAK

This allows trapping of the users trying to stop a programs execution by pressing Right Amiga/Full Stop. The event is initialised with BREAK ON:ON BREAK GOSUM Routinename. The Routine called Routinename could just contain a RETURN, this would have the effect of disabling the Break sequence and nothing else.

COLLISION

This allows programmers to detect collisions on Objects (images created using the OBJECT.SHAPE command). Detection of collisions can be inter-object or object to window. Event trapping or object collisions are initiated with COLLISION ON:ON COLLISION GOSUB Routinename. Routinename can be a subroutine to ascertain which object has collided using the COLLISION command.

Filer

Filer is an example program that can be typed in and used immediately and shows exactly how a lot of the commands above work. Some of the programming style is none to subtle. It was originally written for my own use but I have decided to put it in this article without too many changes.

Filer can be used for storing any type of record that will fit into its format. There are eight files each of which can contain an unlimited number of records. The record format is 99 chars max first field, 25 chars max for next four fields and one char max for the final field. Filer could be used for storing addresses and telephone numbers.

Operating Instructions

To make your own custom disk you will require the Filer disk in drive 0 (internal) and a blank (formatted) disk in drive 1 (external).

When Filer is first loaded and run it checks the disk in drive 1 to see if it is a valid data disk, there are two things which can occur at this point.

A. Filer will see that this is a data disk created earlier already containing some records. If this is the case y ou will be taken into the Workscreen.

B. Filer will see that this disk contains no records or files. In this case Filer will realise the disk is a new one previously formatted and will write the setup files to it.

Whichever option Filer chooses you will eventually arrive at the Workscreen. This is the screen where all of the record entry is performed. There are various menus situated at the top of the Workscreen in the screens Title Bar. The options provided by these Menus will be outlined below.

Main Funcs Menu

WRITE REC: This option is used for actually creating the records. The last record number filed will be displayed. The next record number in the sequence will be displayed awaiting a new record to be entered. The information for DATA 1 is entered first (max length 99 characters). Next DATA 2,DATA 3,DATA 4 and DATA 5 are entered (max length 25 characters). Finally DATA 6 is entered (max one character). Finally you are asked if you wish to enter another.

READ REC: This option allows you to look at a particular record by entering its number. This is useful when a printout has been made and record numbers are taken from this. Enter -1 to leave Read Record Mode.

CLEAR SCN: This option does a simple screen clear useful for some options that do not automatically clear themselves.

QUIT FILER: Always use this option to leave Filer. This is the only way to update the disk file which tells FILER the file names and how many records each file contains on re-entry. If you exit from Filer in any other way all work from the current session will be lost!

Utilities Menu

LAST REC: This option allows you to display the number of the last record stored under a particular file. Use this option to monitor the number of records under each file.

ALL RECS: This option displays all of the records within the chosen file from a selected record number. The last record number is displayed and you are then prompted for a record number from which to start displaying. For example if you have 500 records under a file and you enter 150 at the prompt then records from 150 to 500 will be displayed on the monitor.

AMEND REC: This option allows for the correction of mistakes on a particular record, you must know the number of the record to be amended to use this option. this is useful once a printout has been performed and checked. Any mistakes located can then be corrected using the Amend option.

DISK DIR: This option gives a Directory listing of the files on the data disk.

PRINT ALL: This option will print all the records from the selected file to printer. Do not select this option if you do not have a printer connected or if it is currently offline. Print All is useful for going through all of the records on a particular file with the aim of making any corrections necessary.

File Select Menu

There are no preset items under this menu, the contents are taken from the current record disk inserted. For example if when you loaded Filer you had a Data Disk created earlier with Filer inserted in drive 1 then the eight items under this menu would be the names of any files you created and UNUSED for any files not yet allocated.

If you select one of these files then all of the record based options in the Utilities and Main Funcs Menus will work upon this file. To work on another file select a new one from the File Select Menu.

Alternatively if you have a new disk inserted the items will all read UNUSED.

If one of these items is selected then Filer will prompt you for a file name which must be seven characters long.

Graphics and DOS

One of the most exciting things that can be done in Amiga Basic is to call system routines contained within the Graphics and DOS libraries, although to do this you will need to be conversant with the Amiga Libraries.

The system routines are called using the DECLARE FUNCTION, LIBRARY and CALL functions within Amiga Basic. The LIBRARY function calls a library from disk (if it is not already resident in memory) and opens it up ready for access via the CALL function. The DECLARE FUNCTION statement is used to tell Amiga Basic which system functions you are going to be accessing.

A lot of the system libraries require fairly complex parameters but here I will concentrate on the simpler functions requiring only one argument.

Let's take an example, the graphics library contains the functions MOVE and DRAW. These two functions allow you to specify a start point with MOVE and a draw to point with DRAW. Using this method of accessing the libraries achieves very fast line drawing. Let's say we want a program that draws a line from a point 100,100 to a point 200,200. First we must open the system's graphics library and declare the two functions we are about to use with:

```
DECLARE FUNCTION Move( ) LIBRARY
DECLARE FUNCTION Draw ( ) LIBRARY
LIBRARY "graphics. library"
```

The next step is to move the cursor to the start point 100,100. We achieve this by calling the MOVE function:

```
CALL Move&(100,000)
```

We add the & symbol to the end of Draw because Draw is a variable. This has now moved our graphics cursor to point 100,100. We must now Draw the line:

```
CALL Draw&(200,200)
```

Voila! a line appears on the screen. There will be some example listings later for those of you that wish to try out some actual code.

Another reason for using the system routines within your programs, apart from speed, is to overcome some of the limitations of Amiga Basic. One such limitation is found in the text positioning commands. Normally text is positioned on a graphics screen using the Amiga Basic function LOCATE. Unfortunately this function only works to character spacing and not pixel spacing.

But what if we want to place text on the screen starting at a particular pixel. We can achieve this using the Graphics Library function MOVE just as we did above. Use MOVE to locate the cursor to the required pixel position and then just do a standard PRINT. Using this method of placing text on the screen gives no limitations to exact positioning.

A word of warning at this point, before you can use any of the system libraries you must create what is called a Bmap.file for each library you wish to access. This file is constructed using the program called Fd.Convert supplied along with Amiga Basic on the Extras disk.

The examples below will not work without the associated Bmap.files.

EXAMPLE 1

```
DEFINT x
CHDIR "df0:bmap.files"
DECLARE FUNCTION Execute&()
LIBRARY
LIBRARY "dos.library"
CHDIR "df1:"
x=Execute&(SADD("C-PROGNAME"
+CHR$(0)),0,0)
```

Examples

Most of Example 1 should be clear to you. C-PROGNAME is where you will substitute the name of the piece of code you wish to execute followed by any parameters required by the code. Also you need to chdir to the directory containing the Bmap.file for this particular Library, i.e. in this case the Bmap.file for the "dos.library" is in the directory bmap.files on drive 0.

This example allows you to run object code (programs) written in C, 68000, Modula2 etc. from within your own Basic programs. This can be very useful on two counts. Firstly if you can already program some other language but are working in Basic and find that Basic is too slow, all you need to do is write a short piece of code, and then call that from Basic as shown above.

The second count is where you need to run a piece of specific code

written by someone else and then utilise the results in your own program. This could be used for things like calling Showilbm to display IFF pictures and then returning to Basic for you to render into the pictures from Basic.

EXAMPLE 2

```
CHDIR "df0:bmap.files"
DECLARE FUNCTION MoveScreen(
) LIBRARY
LIBRARY "intuition.library"
intuitwin& = WINDOW(7)
PRINT  "INTUITION= ";intuitw
in&
rast&=WINDOW(8)
PRINT "RASTPORT ADDRESS= ";r
ast&
CALL MoveScreen&(rast&,0,100
)
FOR a = 1 TO 4000:NEXT
CALL MoveScreen&(rast&,0,-10
0)
```

Example 2 shows you how to use the MoveScreen function. Note how we find the addresses of both the Rastport and Intuition windows via WINDOW(7) and WINDOW(8). These are needed by the functions.

EXAMPLE 3

```
CHDIR "df0:bmap.files"
DECLARE FUNCTION SetAPen() L
IBRARY
DECLARE FUNCTION Move() LIBR
ARY
DECLARE FUNCTION Draw() LIBR
ARY
LIBRARY "graphics.library"
rast&=WINDOW(8)
CALL SetAPen&(rast&,1)
CALL Move&(rast&,10,10):PRIN
T "LEE"
CALL Move&(rast&,10,14):PRIN
T "LEE"
CALL Draw&(rast&,100,50)
```

Example 3 shows how to call functions for Moving the graphics cursor, drawing lines and setting a new pen colour. The parameters used in the functions are as follows:

SetAPen&(rastport Address, colour register no).
Move&(rastport address,x,y).
Draw&(rastport address,x,y).

EXAMPLE 4

```
DEFINT a-b
CHDIR "df0:bmap.files"
DECLARE FUNCTION SetAPen() L
IBRARY
DECLARE FUNCTION Move() LIBR
ARY
DECLARE FUNCTION Draw() LIBR
ARY
DECLARE FUNCTION ScrollRaste
r() LIBRARY
LIBRARY "graphics.library"
rast&=WINDOW(8)
 redo:
CALL SetAPen&(rast&,3)
CALL Move&(rast&,10,10):PRIN
T "THIS A TEST"
CALL Move&(rast&,10,14):PRIN
T "OF OVERPRINTING TEXT"
CALL Draw&(rast&,100,50)
FOR a = 0 TO 200 STEP 2
CALL Move&(rast&,0,a)
CALL Draw&(rast&,640,a)
NEXT
FOR a = 199 TO 0 STEP -2
CALL Move&(rast&,0,a)
CALL Draw&(rast&,640,a)
NEXT
b=b+1
IF b=4 THEN b=0
FOR x = 0 TO 20
CALL ScrollRaster&(rast&,0,1
)
NEXT
```

Example 4 combines various combinations of the others, and shows how an effective screen clear can be developed providing the right colours are selected. Also note that using Move & PRINT overprinting of text can be achieved through Basic another feature not accessible without going into the system libraries.

As you may have gathered we have only just scratched the surface when it comes to using the system libraries, but as the kernal manual is several hundred pages long I cannot start to go into depth in such a short article. I only hope you take up the challenge and delve further yourselves.

Overall Amiga Basic is a very comprehensive language and one which I quite enjoyed using although at times it was very frustrating. A lot of the inadequacies have been ironed out in the 1.2 version which should be available soon. In fact a lot of you may have it by the time of reading this. YC

```
'Filer

'Copyright LEE GIBSON 1986.

'REM BREAK ON

REM ON BREAK GOSUB it
CLS
ON ERROR GOTO errorhandle
WIDTH 79
COLOR 1,3
LOCATE 4,15:PRINT "        F
ILER By    LEE.K.GIBSON    Cop
yright 1986"
COLOR 1,0
LOCATE 7,30:PRINT "Written B
y L.K.Gibson."
LOCATE 9,5:PRINT "Filer Is M
enu Driven So Press Right Mo
use Button & Move To Menus"
COLOR 3,2
LOCATE 13,6:PRINT "Please Us
e This Program With Care, Yo
u Could Mess Up Your Data Di
sks!"
COLOR 1,0
CHDIR "df1:"
FOR t = 1 TO 15000:NEXT

    top:
OPEN "subjects" FOR INPUT AS
 #1
FOR a = 1 TO 8
INPUT #1,subject$(a),length(
a)
NEXT
CLOSE 1
errorflag=1

    begin:
MENU 1,0,1,"MAIN FUNCS"
MENU 1,1,0,"WRITE REC "
MENU 1,2,0,"READ REC  "
MENU 1,3,0,"CLEAR SCN "
MENU 1,4,0,"QUIT FILER"
MENU 2,0,1,"UTILITIES"
MENU 2,1,0,"LAST REC "
MENU 2,2,0,"ALL RECS "
MENU 2,3,0,"AMEND REC"
MENU 2,4,0,"DISK DIR "
MENU 2,5,0,"PRINT ALL"
MENU 3,0,1,"FILE SELECT"
MENU 3,1,1,"  "+subject$(1)
MENU 3,2,1,"  "+subject$(2)
MENU 3,3,1,"  "+subject$(3)
MENU 3,4,1,"  "+subject$(4)
MENU 3,5,1,"  "+subject$(5)
MENU 3,6,1,"  "+subject$(6)
MENU 3,7,1,"  "+subject$(7)
MENU 3,8,1,"  "+subject$(8)
MENU 4,0,1,"Filer  Copyright
  L.K.GIBSON 1986  "
MENU 4,1,0,"           FUTURE
EXPANSION          "
IF NOT filename$ = "" THEN
GOSUB makemenu
ON MENU GOSUB checkmenu:MENU
 ON
CLS

     start:
MENU ON
COLOR 1,0 :LOCATE 1,55:PRINT
 "CURRENT FILE = ";filename$
:PRINT :PRINT :PRINT
GOTO start

     writerec:
req$ = ""
MENU OFF
OPEN "r",#1,filename$,200
FIELD #1,99 AS q$,25 AS a$,2
5 AS b$,25 AS c$,25 AS d$,1
```

```
AS E$
GOSUB endrecsub
PRINT "Last record filed was
 No:";lastrec:IF NOT lastrec
=length(subno)THEN length(su
bno)=lastrec

    again:
code%=length(subno)+1
PRINT "Record No: ";code%

    reqsub:
PRINT
IF req$="y" OR req$="y" THEN
 COLOR 1,0:PRINT :PRINT "ENT
ER R TO RETAIN AN ORIGINAL Q
UESTION OR ANSWER":PRINT:COL
OR 3,0
LINE INPUT"DATA 1 ";question
$
IF LEN(question$)>99 THEN GO
SUB inputerror
IF question$="r" OR question
$="R" THEN question$ = q$:BE
EP:COLOR 1,0:PRINT "RETAINED
":COLOR 3,0
LINE INPUT "DATA 2 ";ansa$
IF LEN (ansa$)>25 THEN GOSUB
 inputerror
IF ansa$="r" OR ansa$="R" TH
EN ansa$ = a$:BEEP:COLOR 1,0
:PRINT "RETAINED":COLOR 3,0
LINE INPUT "DATA 3 ";ansb$
IF LEN (ansb$)>25 THEN GOSUB
 inputerror
IF ansb$="r" OR ansb$="R" TH
EN ansb$ = b$:BEEP:COLOR 1,0
:PRINT "RETAINED":COLOR 3,0
LINE INPUT "DATA 4 ";ansc$
IF LEN (ansc$)>25 THEN GOSUB
 inputerror
IF ansc$="r" OR ansc$="R" TH
EN ansc$ = c$:BEEP:COLOR 1,0
:PRINT "RETAINED":COLOR 3,0
LINE INPUT "DATA 5 ";ansd$
IF LEN (ansd$)>25 THEN GOSUB
 inputerror
IF ansd$="r" OR ansd$="R" TH
EN ansd$ = d$:BEEP:COLOR 1,0
:PRINT "RETAINED":COLOR 3,0
INPUT"DATA 6 ";correct$
IF correct$="r" OR correct$=
"R" THEN correct$ = E$:BEEP:
COLOR 1,0:PRINT "RETAINED":C
OLOR 3,0
IF LEN (correct$)<>1 THEN GO
SUB inputerror
PRINT
LSET q$ = question$
LSET a$ = ansa$
LSET b$ = ansb$
LSET c$ = ansc$
LSET d$ = ansd$
LSET E$ = correct$
PUT #1, code%
IF req$="y" OR req$="y" THEN
 RETURN
length(subno)=length(subno)+
1:lastrec=lastrec+1
INPUT"Enter another Y/N";ano
ther$
IF another$ = "y" OR another
$ = "Y" THEN again
CLOSE 1:CLS
lastrec=lastrec+1
RETURN

    readrec:
MENU OFF
CLS
OPEN "r",#1,filename$,200
FIELD #1,99 AS q$,25 AS a$,2
5 AS b$,25 AS c$,25 AS d$,1
AS E$

    readrec1:
GOSUB endrecsub
PRINT "Last record filed was
 No: ";lastrec
INPUT"Record No: ";code%
COLOR 1,0:PRINT "Enter -1 to
 return to Finish":COLOR 3,0
IF code%>lastrec OR code%=0
THEN BEEP:PRINT "RECORD DOES
 NOT EXIST!": GOTO readrec1
IF code% = -1 THEN CLOSE 1:C
LS:RETURN
GET #1,code%
PRINT"DATA 1 ";q$
PRINT"DATA 2 ";a$
PRINT "DATA 3 ";b$
PRINT "DATA 4 ";c$
PRINT "DATA 5 ";d$
PRINT"DATA 6 ";E$
GOTO readrec1

    endrec:
IF filename$="UNUSED." THEN
RETURN
MENU OFF
OPEN "r",#1,filename$,200
FIELD #1,99 AS q$,25 AS a$,2
5 AS b$,25 AS c$,25 AS d$,1
AS E$
lastrec=1

    domore1:
GET 1,lastrec
b=EOF (1)
IF b = -1 THEN PRINT "LAST R
ECORD WRITTEN WAS: ";lastrec
-1:FOR b = 1 TO 4999:NEXT:CL
S:CLOSE 1:RETURN
lastrec=lastrec+1: GOTO domo
re1

    inputerror:
BEEP
COLOR 1,0:PRINT "Input too l
ong or incorrect type, pleas
e enter complete record agai
n"
COLOR 3,0
code%=code%-1
RETURN again
    checkmenu:
COLOR 3,0
menuid= MENU(0)
menuitem=MENU(1)
ON menuid GOSUB mainmenu,ute
smenu,fileselect,nomenu
RETURN
    mainmenu:
ON menuitem GOSUB writerec,r
eadrec,clearscreen,gobasic
RETURN

    clearscreen:
CLS:RETURN

    newfile:
MENU OFF
CLS
LOCATE 1,1
    reenter:
PRINT :PRINT "Please Enter T
he Name Of The New File-Must
 Be 7 Characters In Length.
INPUT a$:a$=UCASE$(a$)
IF NOT LEN(a$)=7 THEN PRINT
"7 Characters Long Remember!
 Please re-enter":BEEP:GOTO
reenter
IF filename$="UNUSED." THEN
subject$(subno)=a$:filename$
=a$:CLS:RETURN begin
BEEP
PRINT :PRINT "SORRY SUBJECT
IN USE! PLEASE SELECT UNUSED
. BEFORE NEWFILE."
PRINT :PRINT "If There Are N
o UNUSED. Options On The FIL
E SELECT Menu Start A New Da
ta Disk."
RETURN
    gobasic:
CLS:MENU RESET
PRINT :PRINT "WRITING UPDATE
D FILE";
OPEN "subjects" FOR OUTPUT A
S #1
FOR a = 1 TO 8
IF subject$(a)="UNUSED." THE
N length(a)=3
WRITE #1,subject$(a),length(
a)
IF subject$(a)="UNUSED." THE
N flag =1
PRINT".";
NEXT
CLOSE #1
IF flag= 1 THEN :GOSUB dummy
file
REM KILL "df1:subjects.info"
 'Remove REM to delete icon'
SYSTEM

    dummyfile:
OPEN "r",#1,"UNUSED.",200
FOR a = 1 TO 3
FIELD #1,99 AS q$,25 AS a$,2
5 AS b$,25 AS c$,25 AS d$,1
AS E$
code%=a
question$="dummy
ansa$="dummy
    "
ansb$=ansa$
ansc$=ansa$
ansd$=ansa$
correct$="a"
LSET q$ = question$
LSET a$ = ansa$
LSET b$ = ansb$
LSET c$ = ansc$
LSET d$ = ansd$
LSET E$ = correct$
PUT #1, code%
NEXT: CLOSE 1
RETURN
```

```
      utesmenu:
ON menuitem GOSUB endrec,all
recs,Amendrec,readdir,printa
ll
RETURN
      allrecs:
MENU OFF
CLS
COLOR 1,0:PRINT "USE RIGHT M
OUSE BUTTON TO PAUSE":PRINT
:PRINT :PRINT:COLOR 3,0
OPEN "r",#1,filename$,200
FIELD #1,99 AS q$,25 AS a$,2
5 AS b$,25 AS c$,25 AS d$,1
AS E$

      readrec2:
GOSUB endrecsub
PRINT "Last record filed was
 No:";lastrec

      redoit:
INPUT"Start record No: ";cod
e%
IF code% > lastrec OR code%
=0 THEN BEEP:PRINT "RECORD D
OES NOT EXIST!": GOTO redoit
PRINT "enter -1 to return to
 beginning"
IF code% = -1 THEN CLOSE 1:G
OTO start

      domore3:
GET #1,code%
b=EOF(1)
IF b=-1 THEN PRINT :PRINT :P
RINT :PRINT"THIS THE LAST RE
CORD":FOR a = 1 TO 9999:NEXT
:CLOSE 1:CLS:RETURN
:PRINT :PRINT :PRINT "This r
ecord No: ";code%:PRINT
PRINT"DATA 1 ";q$
PRINT"DATA 2 ";a$
PRINT "DATA 3 ";b$
PRINT "DATA 4 ";c$
PRINT "DATA 5 ";d$
PRINT"DATA 6 ";E$
code%=code%+1
GOTO domore3

      Amendrec:
IF lastrec <2 THEN GOSUB end
rec
MENU OFF
OPEN "r",#1,filename$,200
FIELD #1,99 AS q$,25 AS a$,2
5 AS b$,25 AS c$,25 AS d$,1
AS E$

      readrec3:
CLS
PRINT "Last record filed was
 No:";lastrec-1
INPUT"Enter record No to ame
nd ";code%
IF code%>lastrec OR code% =0
 THEN BEEP:PRINT "RECORD DOE
S NOT EXIST!": GOTO readrec3
GET #1,code%
b=EOF(1)
IF b=-1 THEN PRINT :PRINT :P
RINT :PRINT"THIS THE LAST RE
CORD":FOR a = 1 TO 9999:NEXT
:CLOSE 1:CLS:RETURN
COLOR 1,0
PRINT :PRINT "This is record
 No: ";code%
COLOR 3,0
PRINT"DATA 1 ";q$
PRINT"DATA 2 ";a$
PRINT "DATA 3 ";b$
PRINT "DATA 4 ";c$
PRINT "DATA 5 ";d$
PRINT"DATA 6 ";E$
COLOR 1,0
INPUT "Amend this record Y/N
";req$
COLOR 3,0
IF req$="y" OR req$ = "Y" TH
EN GOSUB reqsub:CLOSE 1:CLS:
RETURN
CLOSE 1:CLS
RETURN

      readdir:
MENU OFF
CLS:PRINT "DIRECTORY OF DRIV
E 1":PRINT :PRINT :PRINT
FILES
FOR a = 1 TO 9999:NEXT
CLS:RETURN

      fileselect:
IF menuitem=1 THEN filename$
=subject$(1):subno=1
IF menuitem=2 THEN filename$
=subject$(2):subno=2
IF menuitem=3 THEN filename$
=subject$(3):subno=3
IF menuitem=4 THEN filename$
=subject$(4):subno=4
IF menuitem=5 THEN filename$
=subject$(5):subno=5
IF menuitem=6 THEN filename$
=subject$(6):subno=6
IF menuitem=7 THEN filename$
=subject$(7):subno=7
IF menuitem=8 THEN filename$
=subject$(8):subno=8
GOSUB endrec
IF filename$="UNUSED."THEN G
OSUB newfile
RETURN begin

      makemenu:
MENU 1,0,1,"MAIN FUNCS"
MENU 1,1,1,"WRITE REC "
MENU 1,2,1,"READ REC  "
MENU 1,3,1,"CLEAR SCN "
MENU 1,4,1,"QUIT FILER"
MENU 2,0,1,"UTILITIES"
MENU 2,1,1,"LAST REC "
MENU 2,2,1,"ALL RECS "
MENU 2,3,1,"AMEND REC"
MENU 2,4,1,"DISK DIR "
MENU 2,5,1,"PRINT ALL"
RETURN

      printall:
MENU OFF
CLS
OPEN "r",#1,filename$,200
FIELD #1,99 AS q$,25 AS a$,2
5 AS b$,25 AS c$,25 AS d$,1
AS E$

      readrec2:
GOSUB endrecsub
PRINT "Last record filed was
 No:";lastrec
INPUT"Start printing from re
cord No:";code%
CLS
PRINT "PRINTING PLEASE WAIT"
REM IF code%>recordno% THEN
BEEP:PRINT "record does not
exist": GOTO readrec2
IF code% = -1 THEN CLOSE 1:G
OTO start
domore5:
GET #1,code%
b=EOF(1)
IF b=-1 THEN LPRINT :LPRINT
:LPRINT :LPRINT"THIS THE LAS
T RECORD":FOR a = 1 TO 9999:
NEXT:CLOSE 1:CLS:RETURN
 LPRINT"--------------------
----------------------------
----------------------------"
LPRINT "Record No: ";code%
LPRINT"DATA 1 ";q$
LPRINT"DATA 2 ";a$
LPRINT "DATA 3 ";b$
LPRINT "DATA 4 ";c$
LPRINT "DATA 5 ";d$
LPRINT"DATA 6 ";E$
code%=code%+1
GOTO domore5

      endrecsub:
lastrec=1

      domore2:
GET 1,lastrec
b=EOF (1)
IF b = -1 THEN lastrec=lastr
ec-1:RETURN
lastrec=lastrec+1: GOTO domo
re2

      nomenu:
RETURN begin

      errorhandle:
IF ERR =53 THEN GOSUB newdis
k
BEEP:CLS
PRINT :PRINT "You Have Made
An Error Somewhere Please Re
think And Try Again!"
RESUME begin

      newdisk:
CLS
BEEP
PRINT "NEW DISK, MAKING FILE
 PLEASE WAIT!"
BEEP
OPEN "subjects" FOR OUTPUT A
S #1
FOR a= 1 TO 8
WRITE #1,"UNUSED.",0
NEXT
CLOSE #1
BEEP
PRINT "OK FINISHED PLEASE CO
NTINUE"
FOR a = 1 TO 5000:NEXT
RESUME top

      it:
RETURN
```

Armchair Playground

As well as being an amazing business tool, the Amiga is also a fantastic companion for your leisure hours.

By Anne Owen

Amiga games software currently looks very expensive. Although 3.5" disks cost that little bit more, and the col-our packaging and stylish manual boost the costs, the games reviewed still appear overpriced at £29.95 each. Ariolasoft rightly points out the cost of other Amiga software and the fact that they sell games in the UK at cheaper prices than in America.

The packaging is exceptionally well produced although some of the atmospheric pictures and weird profiles take the cult of the designer/programmer to new extremes. In some cases the documentation, although vast and imaginatively written (with manual, quick reference card and sleeve) still fails to convey the information you require amongst the hype for the game. They all look very good on the shelf. The most modest box contains the most brilliant and alarmingly addictive game, *Marble Madness*. Don't miss it.

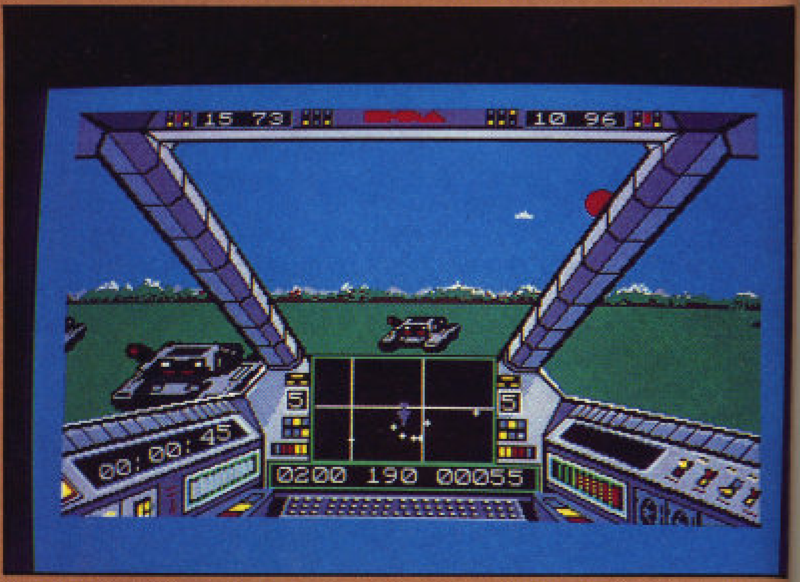
If your dealer doesn't stock Amiga games then they can be obtained mail order from Ariolasoft, 68 Long Acre, Covent Garden, London WC2E 9JH. Telephone 01 836 3411.

SKYFOX

At £30 a throw, you expect a great deal from the games released for your Amiga. After all, you bought it because it's a high performance computer, out of the mainstream, not a clone but a target for the cloners.

Skyfox was universally popular on the Commodore 64 and its conversion to the Amiga could have been a welcome one. It's the ultimate "blast 'em to kingdom come" game with some token strategy thrown in.

The first thing you find out after the impressively stirring and military style stereo opening tune has died away is that mouse control is close to useless. Joystick required. When you've chosen from the multitude of options concerning your own ability and the force and make-up of the enemy attack, information about your immediate position is flashed on screen. The basic map can be called up on screen during combat to update you on the relative positions of your *Skyfox*, your home base and the attacking hordes of tanks and aircraft.

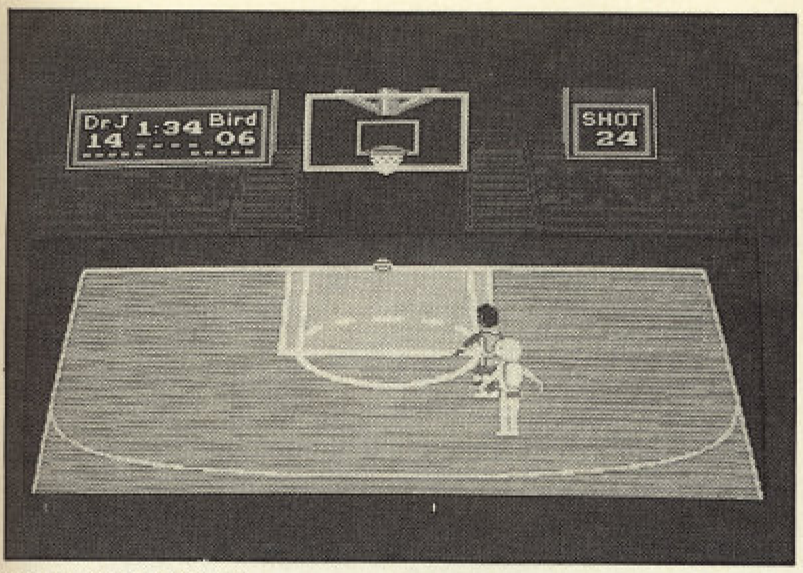


After launch, information is gleaned from a radar scan pinpointing the enemy as they close in on you. One display suitable for general positioning, another for pinpointing individual targets. At close range you fire on sight. When you have wiped out one attack wave, an autopilot whisks you away to the next battleground. Just hope that the joystick doesn't give out on you or a red mist will envelop the screen as it cracks open with the heat. The lack of a real explosion is an anticlimax!

The graphics, both instrumentation and moving military hardware, are detailed but without realism. The sound (if you hook the Amiga up to your stereo) is straight out of a war movie. *Skyfox* is a classic game but you get the feeling that because it's a conversion, it's a brilliant computer making an ordinary game acceptable. An action cartoon for those who aren't easily bored by shooting things in spectacular fashion.

Touchline

Name: *Skyflow.* ***Price:*** *£29.95.* ***Machine:*** *Amiga.* ***Supplier:*** *Ariolasoft, 68 Long Acre, London WC2E 9JH.* ***Tel.*** *01 836 341[1].* ***Originality:*** *6/10.* ***Graphics:*** *6/10* ***Playability:*** *7/10.* ***Value:*** *6/10.*



ONE ON ONE

Despite the restricting scenario and screen playing area of a one on one basketball match, One on One is a very addictive and enjoyable game. There are many subtle variations of skill level – make sure that you start "in the park" to give yourself a chance. Options are available between games from pull down menus.

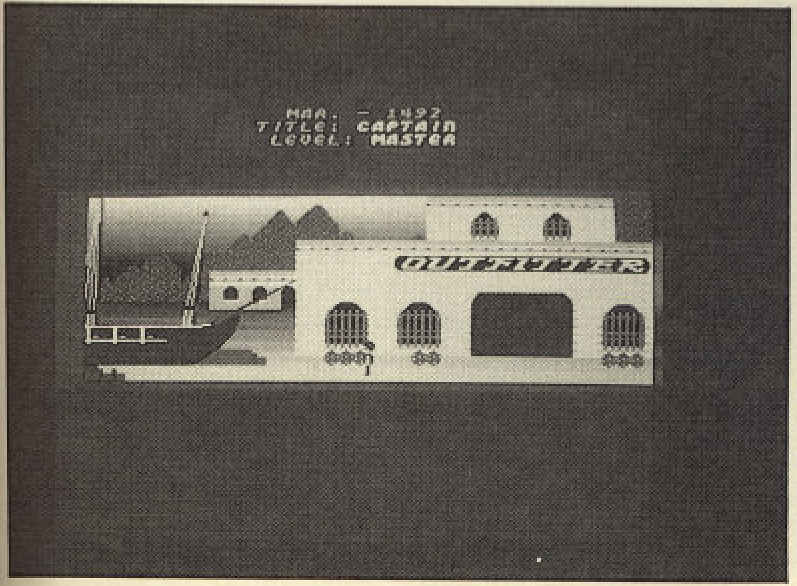
One of the features that is going to make Amiga games stand apart from the rest is the digitised sound which can be incorporated into a game to give it added realism. In *One on One* the crowd noise is just that, a recorded basketball crowd complete with yells of "Shoot". The referee even yells out the fowls, "offensive charging" and the sound of the ball bouncing is very realistic. It's a sort of Harlem Globetrotters cartoon but you are in there controlling one of the players.

The graphics and music are a bit ordinary but the game itself is relaxing light entertainment and one I keep going back to for a bit of fun. Mouse control is also supported so you can play with the basic system.

Touchline
Name: *One on One.* ***Price:****£29.95.* ***Machine:*** *Amiga.* ***Supplier:*** *Ariolasoft, 68 Long Acre, London WC2E 9JH.* ***Tel:*** *01 836 3411.* ***Originality:*** *7/10.* ***Graphics:*** *6/10.* ***Playability:*** *9/10.* ***Value:*** *8/10.*

SEVEN CITIES

This game strikes me as a fairly tame piece of software. Clever software it may be with vast computer generated territories to explore, complex maps and elements of skill and planning required to succeed, but it lacks immediacy and doesn't really use the Amiga to its full. The opening screen of an animated hand writing the title with appropriate swash buckling music is the high point.



Some token sprite graphics are employed at the court of the European king before you set out on your journey of discovery to the west. Despite a shiney manual full of information, the lack of on-screen prompts is annoying. Some genuine historical content would have sustained more interest.

Seven Cities provides your first map and game but also offers the option to create your own map discs. So, if this is your sort of game, the lifespan is indefinite. A lifetime exploring with *Seven Cities* and trading with mythical natives is not an option I would personally consider and I think that conventional adventure formats still have more to offer in way of excitement.

Joystick is needed because both keyboard and mouse control is very awkward. Unless you are rally besotted with strategy type games then this one can be given a miss.

Touchline
Name: *Seven Cities.* ***Price:*** *£29.95.* ***Machine:*** *Amiga.* ***Supplier:*** *Ariolasoft, 68 Long Acre, London WC2E 9JH.* ***Tel:*** *01 836 3411.* ***Originality:*** *8/10.* ***Graphics:*** *5/10.* ***Playability:*** *5/10.* ***Value:*** *5/10.*



MEAN GAME OF GOLF

What is it about the Amiga and golf? Do those stripey-suited marketing men reckon that the sophisticated Amiga user leaves go of the mouse only to take up his clubs? Maybe they're right since I was happy to take up the challenge laid down by Accolade's Mean 18 golf game and to draw comparisons with Leaderboard.

From a playing point of view, Mean 18 lives up to its name with accurate and difficult to master representations of famous courses such as St.Andrews, Augusta National and Pebble Beach. There is much less tolerance oa bad play in Mean 18 than in Leaderboard and the Mean 18 practice feature is a necessary preliminary phase to get a feel for the controls and to find your own balance of power and accuracy.

Mean 18 doesn't take you round the course as smoothly as Leaderboard since you need to click the mouse button too

often to prompt the next stage. Television techniques like fade and dematerialise, clever though they are, slow down the pace of the game.

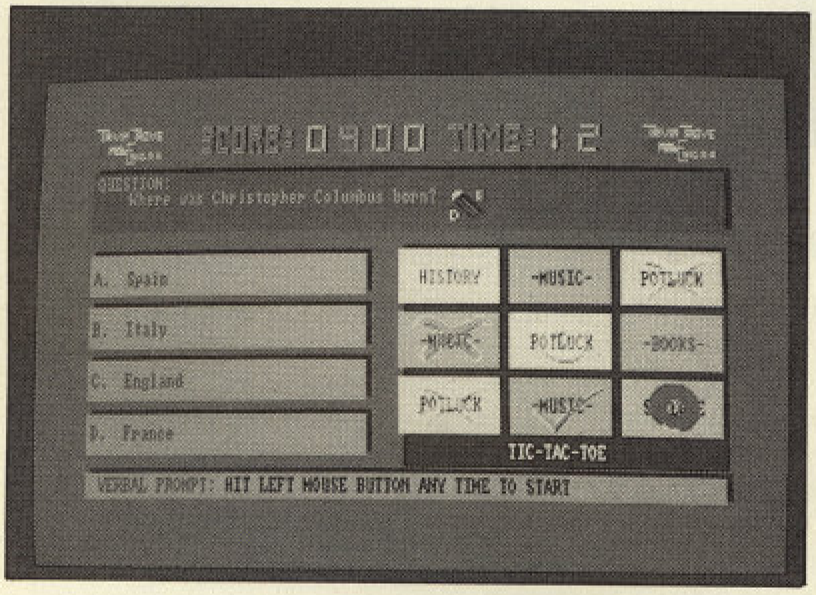
The multiple options on players – up to four; types of scoring – stroke, match and best ball; tees – professional or regular; skill – experienced or beginner, make for variation. Beginners get caddie advice on club choice as well as perfect aim. Game options are practice (tee, green or a hole of your choice), begin round and quit. You can save a game in progress for later retrieval.

I am not too fond of the graphics which make up the course although utilising consistent shades for fairway, light rough, deep rough etc. helps the player. The main let-down is the play on the green with an overhead view of the putting surfaces. It destroys any feeling of realism, is awkward in use and reminds me too much of a snooker simulation.

A major plus for the potention DIY golf course designer is the Architect supplied with Mean 18. The example fictitious course, Bush Hill, shows what it can do. So if you want to simulate a round at your local links, Architect is the answer. It's quite a complicated matter so you may have to restrict your immediate ambitions to your favourite hole! You can 'paint' and 'fill', set down trees (which may be modified) and bushes, modify the skyline, change the shape and position of the green, place the tee and set par for the hole.

There's plenty of attention to detail in Mean 18 with club choice and terrain combining for the likeliest results. Although Leaderboard has replied to the classic courses idea with a new set of 'realistic' courses, Mean 18's Architect remains unique. I think Leaderboard is the neater design but Mean 18 has more features for the money and provides a tougher challenge at 'professional' level.

Touchline
Name: *Mean 18.* ***Price:*** *£29.95.* ***Machine:*** *Amiga.* ***Supplier:*** *Precision Software, 6 Park Terrace, Worcester Park, Surrey KT4 7JZ.* ***Tel:*** *01 330 7166*
Originality: *6/10.* ***Graphics:*** *5/10.* ***Playability:*** *8/10.* ***Value:*** *7/10.*



TOUCH OF TRIVIA

Trivia Trove from Enigma is software for those who enjoy showing off their general knowledge. If you always win the ubuquitous TV quiz shows like Bob's Full House while lazing back in your armchair then Trivia Trove will test you further. It will also enable you to devise your own questions in a sort of 'Trivia Construction Set'. This trivia generator manages a file of up to 500 questios, letting you edit them, print them out for checking and finally saving to disc for retrieval by the game. All question data is saved on the Amiga's external disc drive and Trivia Trove relies on a two disc system to work.

The game consists of different levels and is like some of the arcade machine trivia games and nothing like Trivial Pursuit. The displays are attractively drawn but there could perhaps have been scope for some sound effects?

Each level of Trivia Trove can be completed by answering the appropriate number of questions correctly. The questions are 'chosen' by the player by, typically, clicking on a mouse button as the desired subject area is highlighted. Some of these 'choices' are crucial to the game, as in Level 2 where the sluggishness of the software reacting to the mouse introduces an undesirable random effect. You have a time limit to select the correct answer to the question.

Packaging and documentation is minimal and 'home-made'. In general, it's a game I enjoyed. If you have a use for the question and answer database then you are getting real value for money.

Touchline:
Name: *Trivia Trove.* ***Price:*** *£ .* ***Machine:*** *Amiga.* ***Supplier:*** *Cavendish Computers.*
Originality: *5/10.* ***Graphics:*** *6/10.* ***Playability:*** *7/10.* ***Value:*** *6/10.*

Archon

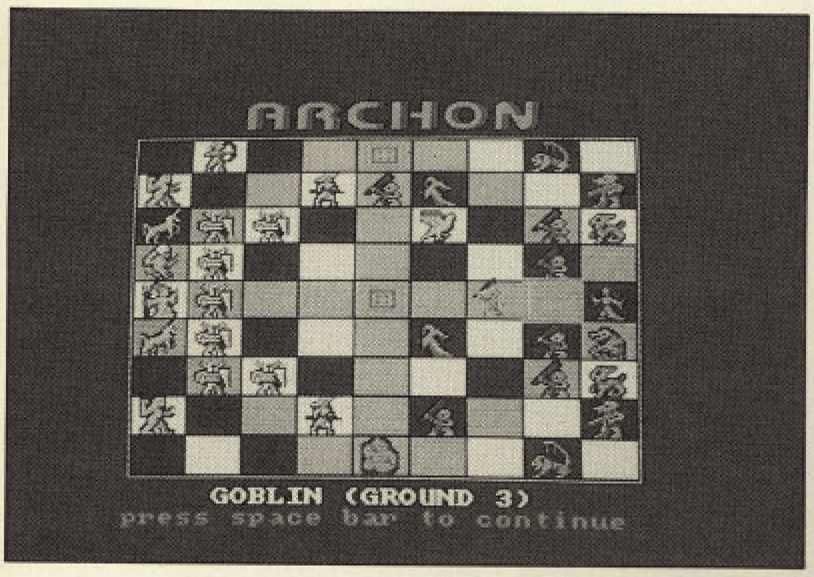
Without dount, this is a tremendous game and an original one despite the familiar chessboard layout. It makes good use of the Amiga's qualities with smooth graphics and imaginative sound. The opening sequence is like that of a short film or cartoon with design and programming credits. The documentation is fulsome, with a quick reference card for the various "pieces" or icons. The main booklet sheds light on the complexities of luminance cycles,c asting spells and charmed squares and it does so with a fair bit of humour.

I certainly felt I'd got my money's worth, especially since it can be a two player game. No humans in tonight? Then play the computer. Depending on the current abilities (standard to advanced) as declared by the combatants, a handicapping system ensures a close game.

Watch out though: You can only play Archon with joystick and you'll need two for the two player mode since direct combat is ivolved. Whenever icons clash on a square at the "strategic" level, combat is joined. The two icons duel with the weapon that is their speciality, with the tactics appropriate to their style of fighting and for as long as their allotted lifeline will allow.

Even in victory, the icons can become weakened. Depending on many factors they may recover somewhat or remain weak, easy prey to another hostile icon. The wizard (mage) of the light side and the sorceress(of the dark) are central figures in the game; their spell casting can turn the tide in their favour through use of magic to REVIVE, HEAL, EXCHANGE, IMPRISON and TELEPORT. IMPRISON and SHIFT THE COURSE OF TIME can be used with subtlety to powerful effect on a key rival icon.

Each type of icon has its own fascinating and fantastic set



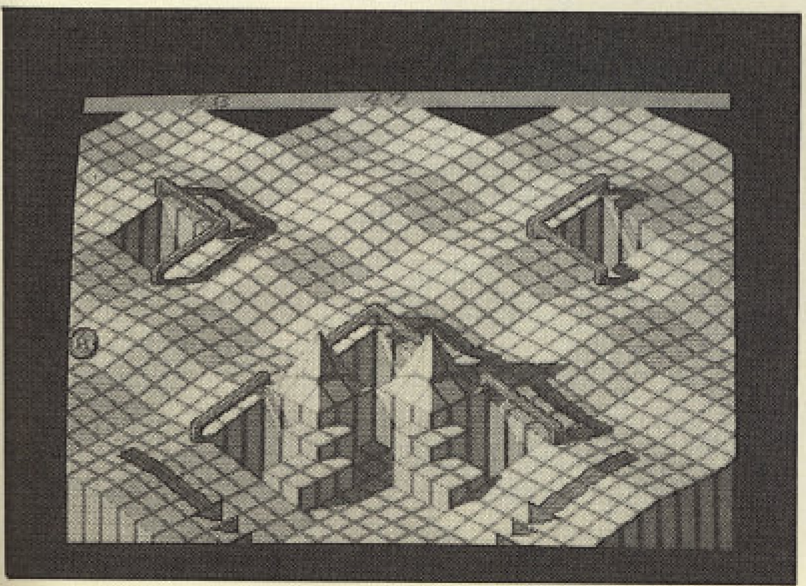
of characteristics and these must be taken account of when doing battle. The knights and goblings are the grafters of the two sides, light and dark. By getting close and sticking with the opponent they can come up with surprising results. There are flightier characters, zombie rock throwers, fireball firers and twangers (archer and Manticore). The banshees are deadly when skilfully flown in close. The Phoenix seems to flatter to deceive but the power is there to be harnessed.

The dual personality of Archon – light and dark, tactician and warrior, the speed of battle but the calculation strategy demanded for victory – makes it an absorbing game. The two player version completes a well designed and enjoyable entertainment.

Touchline
Name: *Archon.* ***Price:*** *£29.95.* ***Machine:*** *Amiga.* ***Supplier:*** *Ariolasoft, 68 Long Acre, London WC2E 9JH.* ***Tel:*** *01 836 3411.* ***Originality:*** *9/10.* ***Graphics:*** *8/10.* ***Playability:*** *9/10.* ***Value:*** *9/10.*

MARBLE MADNESS

When the Amiga became public property the game Marble Madness was instantly associated with it because the graphics served as an early demo of what the computer could do. Now the classic arcade hit is available for all to play. Nor is it just showy graphics; it's stunning music and a game to stretch your nerves taught as the time counts down with your goal in view, screen after screen.



The game disk is recognised by WorkBench – the Amiga's icon graphic/mouse environment – and you double click the disc icon and then the marble icon to boot the game into action. The opening screen is ordinary. The author, Larry Reed, for whom I have the greatest admiration, saved the best for the game.

Screen one, the practice run, is mastered fairly quickly. The landscape is red and yellow with black gridlines. The three dimensional graphics are excellent, the accompanying tune snappy, percussive, urging you on, into the groove, rolling realistically towards the GOAL area at the end of the path. The pattern is set for the other, more complicated screens, to come. You should be getting plenty of bonus points for time left after just a few runs.

Screen two and new music, a blue landscape, a deep base bounce as you ricochet, pinball like, from the 3D blocks. There's an agressive black marble which you can force off the edge of the playing surface for 1,000 points, green/yellow dolly mixture creatures which send your marble into a spin and try their best to leap on top of it – a sticky end. You have to negotiate ramps and bridges, spin down metallic pipes and be ready to control your marble on a strangely angled surface at the bottom of the shute. A green shaded surface, gleaming like an empty swimming pool in the sun, puts the skids under your marble for a final spurt to the in-GOAL area. Finished.

By now I've discovered that joystick control is very inferior to mouse control. The original game used trackball and a trackball option is available for the Amiga game. I haven't been able to try it so mouse is next best. Two types of trackball, joystick and mouse are supported, as is one and two player mode. The input device can be assigned to front or back port. The choices are offered after each completed game. You can also increase the difficulty level (less time per screen) at this point (range 0 to 7). The two player version means two marbles contending for the same space and can make for some very aggressive play!

Each screen is a time trial. You can lose control of your marble and it may drop beyond the 3D playing area and over the edge with a heart rending scream/whine. An animated brush may come in and sweep away the broken pieces! The marble will always be spun back into position but time is ticking away. The marble may be injured and give out a yell and spin in pain. You start to get emotionally attached to your marble! The faster you complete the early screens the more chance you have of success later on so you have to balance bonus points against the time taken to get them.

On to screen three. Dropping in a controlled fashion! from a slide, the marble has to negotiate a groove cut in the surface. Vital seconds can be wasted in this awkward maze. The screen is dark, the colours and music foreboding. The tempo quickens as you try to didge the green slime that dissolves your marble instantly on contact. Rolling down a red metallic shaft brings more points. The paths get even thinner and a sharp rising corner finishes the screen. GOAL!

Screen four, red and gold graphics and the aerial race bonus. The marble drops from a high platform (like an elevated golf tee), down a slide and out into space. As you hit the platform below, you have to employ reverse thrust on the mouse to stay around. Hitting the joystick or mouse button gives the marble a temporary boost in speed. This can now be used to jump gaps in the paths. It is also needed to rush past the vacuum cleaner-like heads which pop up and, vibrating, suck at your marble, throwing it off course and, if it gets held

in the suction, destroying it completely.

The marble also finds itself catapulted from one platform to another. On landing a really agressive black marble gets after you. You're lucky to stay above ground at this point. Metal rods now poke up from the path, steering you over the edge. As well as negotiating the corners you have three malicious rubber hammers popping up out of trap doors to dislodge you, working in unison to bring a frustrating end to a brilliant run to GOAL.

Screen five – the crazy screen – and, as it sayd on screen, "Everything you know is wrong". From now on it's uphill, climbing thin ramps and being suckled up pipes. A new and deadly airborne peril further complicates the perilous journey of your marble. Great tune.

Get through this one and it's on to the ultimate level. Out in space with an icey surface to make changing direction extremely difficult. Progress is further delayed by bridges that form before your eyes.

The music which accompanies each level plays a great part in hooking the player into the game. Sequencer style electronic sounds combine with electronic piano chords and the sound effects unique to computer games. These accompany the marble as it slides down shutes and hits rough or icey terrain. The music serves another purpose, waking you up when the next level arrives (the disk drive is accessed before each new screen and takes some seconds). The completion of each level is greeted with a variety of fanfares in the style of the main music.

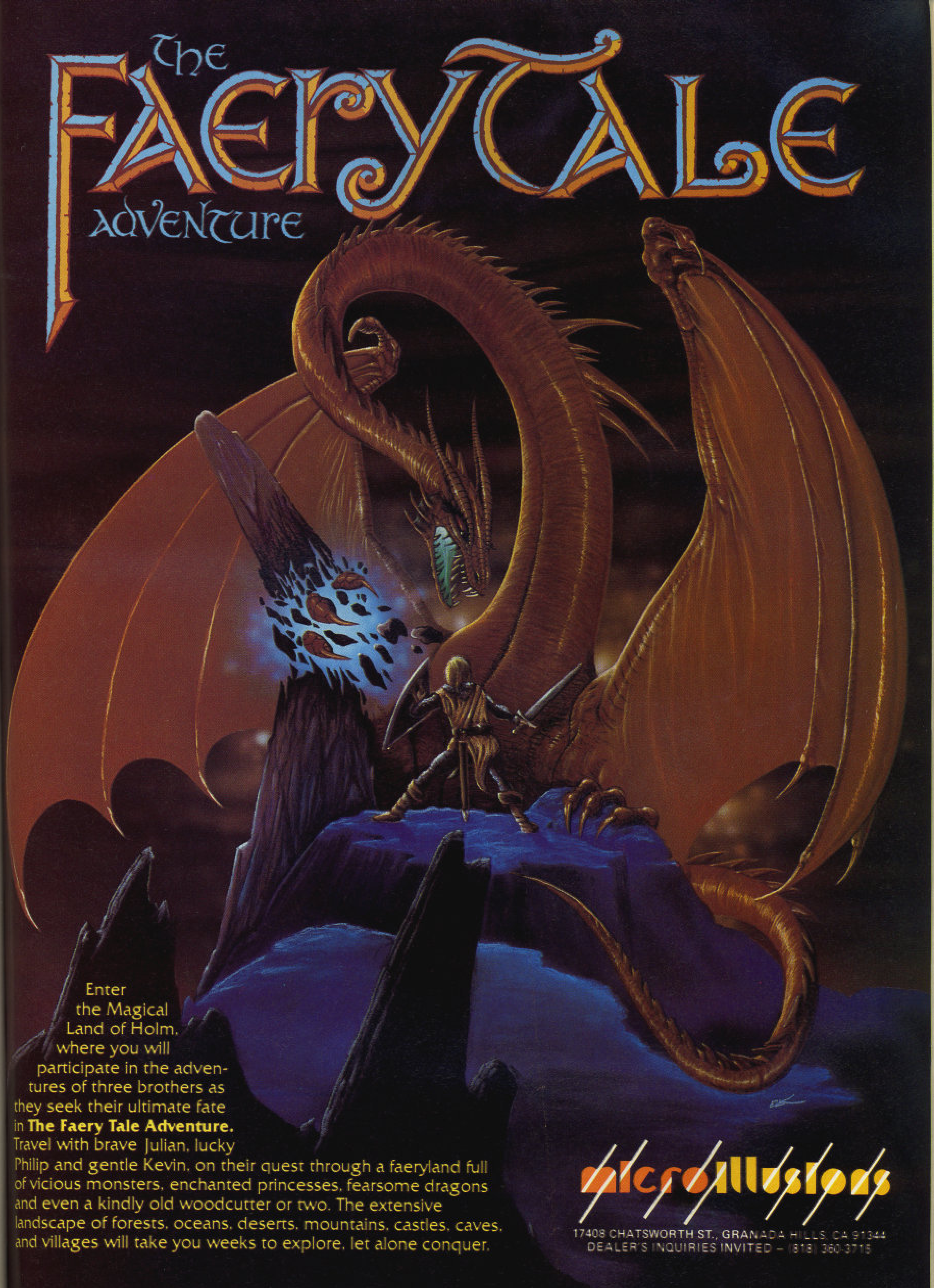
The graphics are very effective. The three dimensional terrain is made even more convincing by flase light and shade. Each screen is full of detail: when a bridge is raised you can see the mechanism beneath and some of the creatures have an almost organic appearance, the slime glows fluorescent green and a flat surface does the equivalent of a Mexican wave!

Playing Marble Madness gives you the same feeling as walking a tight-rope, teetering on the edge of failure but with triumph in view. Even at currently inflated Amiga prices, the game is an essential purchase. It was Atari's in the Arcade, Electronic Arts have produced it for the Amiga and you can get it from Ariolasoft in the UK

Touchline

Name: *Marble Madness.* ***Price:*** *£29.95.* ***Machine:*** *Amiga.* ***Supplier:*** *Ariolasoft, 68 Long Acre, London WC2E 9JH.* ***Tel:*** *01 836 3411.*

Originality: *8/10.* ***Graphics:*** *9/10.* ***Playability:*** *10/10.* ***Value 10/10.***


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Pagesetter

Desk top publishing is taking off in a big way. The Gold Disk company is determined that the Amgia won't be left behind in the rat race.

By Georges Duval

In business computer terms, the buzz word at the moment is Desk Top Publishing, or DTP to jargon lovers. From the moment that Apple released the Macintosh based DTP package, using a laser printer capable of producing text of near-typeset quality, the market exploded, until soon there were hundreds of products ranging from the most rudementary poster printers, to some incredibly complex packages capable of producing a complete magazine.

When the Amiga was officially released in the UK, there were already companies developing DTP software, but as so often happens nothing was ever produced except a few good ideas. One company that did bother to exploit the possibilities of this 'colour Macintosh' is The Gold Disk company, and their product, *PageSetter*, has recently become available.

First Impressions

Immediately upon opening the manual, I was endeared to this program for, unlike so many software packages, it has no protection, thereby allowing the honest user to make backups for personal uses. I have spent too many hours trying to salvage lost programs and data to be fond of programs that arrive with ridiculously stringent protection.

Unlike almost all the other currently available business machines, software written for the Amiga does not need to include complicated printer routines, as these are all handled by Preference (the system setup program). This means that Programs such as *PageSetter* can work on a variety of printers, although as yet only on one group of laser printers, the Hewlett Packard Laserjet range. With care, however, excellent results can be achieved on a variety of printers including most of the popular Epson compatibles.

As with all good software for mouse based systems *PageSetter* makes the most of the easy to use icon system and, unlike almost all the other DTP packages I have seen, within 10 minutes it is possible to have the main structure of a page planned out.

Starting Out

To create a page *Pagesetter* works in a series of 'boxes'. Each box, created by the user, can be any size and can contain either graphics or text. There are two ways of creating boxes. Either you can pick the box icon, and create a box on the screen, or you can import a picture or some text from outside *PageSetter* and use the Autobox function to create a box of the right size.

Boxes can be as big or small as the user wants, and in order that long passages of text can be included, boxes can also be linked. When setting up the page, it is always necessary to zoom in on certain sections and *PageSetter* uses the familiar 'Magnifying glass' icon. This can zoom right in on any section of the page, not at all, so that the page is in WYSIWYG (What You See Is

What You Get) format. Once you have created a box, you can make the most of some of the available effects. In this mode it is possible to change the texture for the box background, the style of border, the font for the box, the justification, and so on.

Graphics

In addition to complex text layouts, *Pagesetter* allows the user to add graphics anywhere on the page. Although *PageSetter* comes with a variety of basic pictures, it is the ability to import IFF (International File Format) graphics from packages such as *Deluxe Paint* and *Aegis Images* that allows the user to create some truly stunning layouts. To make the most of the graphics ability to *PageSetter*, it is necessary to use the Palette control of *Deluxe Paint* to render the pictures black and white, for *PageSetter* was designed before Eddie Shah decided that colour was a necessity.

As with any complex program *PageSetter* takes some getting used to, and many early pages will be no more than an unrelated collection of garbage. A few hours playing, however, is one of the best ways to learn the ins and outs of programs such as this, and I for one found the manual both comprehensive and, for a computer manual,surprisingly understandable!

In order to cope with semi-professional publications, *PageSetter* has the ability to create a document of up to 99 pages long. However, as the main program is 141k, and each page (without complex graphics) takes up between 7k and 10k, most unexpanded Amigas will be able to produce a document up to about 40 pages in length.

Editors

Although *PageSetter* is intended primarily as a page design and layout package, it does contain powerful graphics and text editors that, because they were designed specifically for the package, are often better suited for producing graphics and text than other 'external' programs. The graphic editor has several features that make it unique, and perfect for DTP.

First and foremost it is black and white. This is because eventually it will be printed, and very few people have colour printers. To make the most of the graphic editor, there are a variety of shades that can be used, and if you import a colour picture from another package, the shading will almost certainly be very unpredictable.

Another main difference is that *Pagesetter* uses a graphics resolution of 640 × 200, whereas most graphics packages uses 320 × 200. This is to maintain as close as possible a correlation between the screen and the printer on which the hard copy will be produced. The graphic editor has a variety of functions that will allow most artists (or in my case idiots) to create something that appears to be a picture, although the quality of the picture is, as always, directly correlated to the amount of time you spend producing it. Once you have created a masterpiece, it will be necessary to frame it, in order that its size can be manipulated, and eventually so that it will fit in the hole you have made for it!

Although the graphic editor is important, the part of the program that most serious users will spend most time with is the text editor. As with its graphics sibling, the text editor is different in many ways to external word processors. Because of the power of *PageSetter*'s own formatting commands, it treats formatting commands in improved text as words, which must therefore be removed by hand. Thankfully, the program can successfully import text from either *Textcraft* or *Scribble*! without any problem.

TABLE 1

Typeface	Sizes available (point)			
Ruby	8	12	15	
Sapphire	15	14	18	19
Opal	9	11	12	
Garnet	9	16		
Diamond	12	20		
Emerald	17	20		
Topaz	11	(=8 9 in ROM)		

Manual On

Most users of *PageSetter* will, it seems to be expected, complete novices to the world of publishing and, to that end, the manual spends a great deal of its time telling the user how to set out pages, and how to grab the readers attention. Thankfully this is done in a matter of fact manner and surprisingly manages to avoid being too patronising. Chapters deal with setting up newsletters, creating advertisements, and laying out a page with a photograph.

Summing Up

As you would expect on a program such as this, the fonts available are only those that the Amiga provides (table 1), and there is no facility for the user to define or import any new ones. When compared to the likes of *PageMaker* on the Apple Macintosh, *PageSetter* seems to be very Basic, but then it never claimed to be a professional publishing system. However, for anyone who wants to produce newsletters that look very impressive, or basic advertisements with pretty black and white picture, *Pagesetter* could be just the ticket. It is easy to use, comes with an excellent manual, and teaches many of the fundamentals necessary for successful DTP.

Considering the poor quality of a a great deal of the software available for the Amiga, including some of Commodore's own, it is refreshing to find a company that cares enough to put this much work into a product.

YG

Touchline
The Gold Disk Inc: *P.O. Box 789, Streetville, Ontario, L5M 2C2.*

Everyman's Guide to Graphics

Graphics are a fascinating application for the C64. In this comprehensive guide, we point the way to better understanding and use of this facility.

By Allen Webb

In my view, the crucial part of any piece of software is the graphics. There are very few items which need no attention to graphics, with even a text only package being improved by a redesigned font.

In this article, I want to give a detailed run down of the C64's graphics capability and how you can use it. Where it simplifies life, I will give listings of of helpful routines

Vic Chip

First, let us consider the driving force behind graphics, the VIC-II chip. This chip controls the graphics system which can in turn be altered via a number of registers. These registers are memory mapped allowing you to change them easily. Table 1 lists the most useful registers.

That's a pretty meaty lump of information and it's only provided as reference material. The rest of this piece will show you how the more important registers are used.

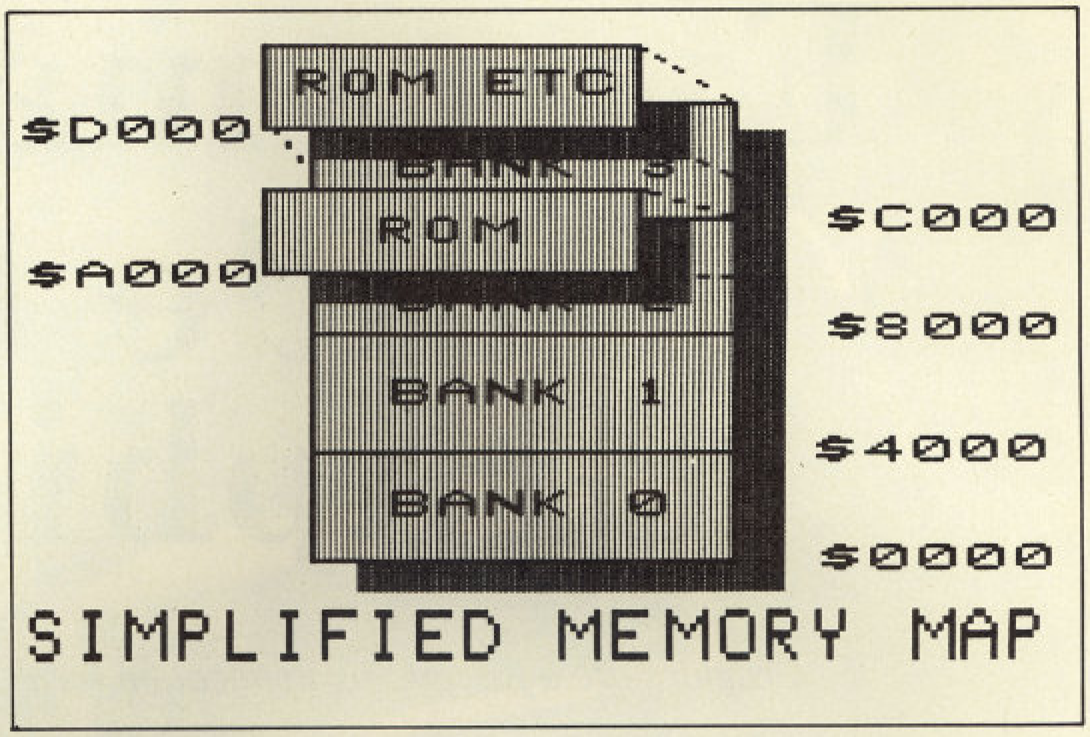
If you want to use your 64 efficiently, an appreciation of how it handles its memory is necessary. Figure 1 gives a simple memory map.

Table 1

Register	**Bit**	**Function**
$D000-$D010 (53248-53264)		Sprite positions
$D011 (53265)	7	Raster Compare
	6	Extended colour mode
	5	Bit map mode
	4	Blank screen
	3	24/25 row text
	2-0	smooth scroll Y direction
$D012 (53266)		Raster Read/write
$D013-$D014 (53267-53268)		Light Pen registers
$D016 (53270)	4	Multicolour mode
	3	38/40 column text
	2-0	Smooth scroll X direction
$D017 (53271)		Y expand register
$D018 (53272)		Memory Control Register
	7-4	screen matrix
	3-1	Character table
$D019 (53273)		Interrupt register
$D01A (53274)		IRQ mask register
$D01B (53275)		Sprite priority register
$D01C (53276)		Sprite colour mode register
$D 01D (53277)		X expand register
$D01E (53278)		Sprite to sprite collision register
$D01F (53279)		Sprite to background collision register
$D020 (53280)		Screen border colour
$D021.$D024 (53281-53284)		Background colour registers
$D025-$D026 (53285-53286)		Sprite multicolour registers
$D027-$D02E (53287-53294)		Sprite colour registers

The memory map can be considered to consist of two layers. The bottom layer is a block of 64K of RAM. On top of this are superimposed two areas of ROM and other chips. Since different devices occupy the same addresses, a register at address one is used to decide which are switched in. In normal use, the RAM under the ROMs is unavailable to Basic but it can be used for graphics.

The 64 treats the block of RAM as four banks of 16k:
Bank0–$0000–$3FFF(0 to 16383).
Bank1–$4000–$7FFF(16384 to 32767)
Bank2–$8000–$BFFF(32768 to49151)
Bank3–$C000–$FFFF(49152 to 65535



Bank 0 is the default bank. The bank in use is specified in bits 0 and 1 of location $DD00.

The VIC can only address one bank at a time and it expects to find an area of screen memory and a character set withing the bank. This approach offers almost unlimited flexibility but also makes the use of graphics in the default bank restricted.

Since the CPU and the VIC chip operate independently, the CPU doesn't care which bank is used for graphics. We can therefore reconfigure the machine from Basic very easily.

Let us consider how to reconfigure the memory map.

Changing the BANK

This is achieved easily by changing the register at $DD00:

10 POKE 56578, PEEK(56578) OR 3
20 POKE 56576, (PEEK(56576) AND 252) OR(3-BN)

Line 10 prepares the ground and line 20 switches in BANK number BN.

The VIC chip ignores the absolute address of the bank and uses only the relative addresses within the bank, i.e. each bank ranges from $0000 to $3FFF.

Moving the Character Set

The register at 53272 tells the VIC chip where to get its character data. In fact, bits one to three hold this information.

This information is changed by:

POKE 53272, (PEEK(53272) AND240) OR X

X is equal to the start adress of the character data divided by 1024. With only three bits used, only eight character sets are possible i.e. x = 0,2,4,6,8,10,12,14.

Since the machine powers up with a character set, there must be default information somewhere. In fact, the default character set is held in ROM. This data is imaged to banks 0 and 2 and is found at the following addresses:

$1000-$17FF (Lower case set X=*4)*
$1800-$1FFF (Upper case set X=6)

Clearly, it is possible to have a number of different sets of characters in a bank and simply switch between them as needed.

Moving the Screen

The screen comprises of 1000 bytes of contiguous memory which usually resides between locations 1024 and 2024. This position is specified in bytes 4 to 7 in location 53272. These bytes actually specify the position of the screen in any bank of memory, and can be changed by:

POKE 53272, (PEEK(53272) AND15) OR Y

Y is equal to the start address of the screen divided by 64. This time we have four bits in the register allowing 16 possible screen positions with Y ranging from 0 to 240 in increments of 16. Unfortunately, you cannot use all RAM areas for the screen. If you use the areas imaged by the character ROM, you will get garbage on the screen.

In addition to changing the VIC register, you must also tell the operating system where the screen is. This is done with:

POKE 648,SCREEN/256

where SCREEN is the start address of the screen area.

The screen colour matrix cannot be moved and, in fact, presents no difficulties.

Listing 1 allows you to reconfigure your 64. The first part asks you to specify where the screen and character set are to go. These values are checked to ensure that they are in the same bank and are not at the same address. It doesn't check any further so beware. Line 60 to 80 calculate the register values. Line 90 checks to see if you need to copy down the character set and lines 100 to 150 do this job if required. Lines 160 to 190 reconfigure the machine.

Listing 1: Reconfigure

```
26   10 PRINTCHR$(147): INPUT "SC
     REEN POSITION";SCREEN
44   20 INPUT "CHARACTER SET ADDR
     ESS";CHARS
F0   30 IF SCREEN = CHARS THEN E$
     ="ERROR..CHARS AND SCREEN AT
      SAME ADDRESS":GOTO60000
A1   40 IF INT(SCREEN/16384)=INT(
     CHARS/16384)THEN60
34   50 E$="ERROR..CHARS AND SCRE
     EN NOT IN SAME BANK":GOTO600
     00
```

```
1B  60 X=INT(SCREEN/16384)
58  70 Y=(SCREEN-X*16384)/64
95  80 Z=(CHARS-X*16384)/1024
E1  90 IF Z<>4 AND Z<>6 THEN
8E  100 PRINTCHR$(147)"COPYING R
    OM CHARACTER SET...THIS WILL
    [SPC3]TAKE A WHILE"
F4  110 POKE56334,PEEK(56334)AND
    254
4F  120 POKE 1,PEEK(1) AND 251
A2  130 FORI=0TO2047:POKECHARS+I
    ,PEEK(53248+I):NEXT
F6  140 POKE1,PEEK(1)OR4
03  150 POKE56334,PEEK(56334)OR1

17  160 POKE56578,PEEK(56578)OR3

12  170 POKE56576,(PEEK(56576)AN
    D252)OR(3-X)
3B  180 POKE53272,Y+X
B3  190 POKE648,SCREEN/256
C3  200 PRINTCHR$(147)"DONE"
52  210 END
FD  60000 PRINT:PRINTE$
9C  60010 GET I$:IFI$=""THEN6001
    0
38  60020 GOTO10
```

In my view, the crucial part of any piece.

Run Listing 1 putting the screen at 50176 and the character table at 51200 and then enter the line:

POKE 44,4: POKE 1024, 0: NEW

You will have a machine offering 39933 bytes for Basic and 144 sprites. That's a lot more than you get on switch on! This extra capacity is achieved by:

1) Using BANK 3 and moving the screen and character set to a handy block of RAM between the ROMs.
2) Moving the start of Basic program storge down to 1025. Since we've moved the screen we can use the normal screen area for Basic.
3) You can use the memory behind the Kernal ROM ($E000 to $FFFF) and the remaining memory between the ROMs ($C000 to $C3FF) for sprites.

Machine code users don't have such a tough time since they aren't constrained by where they have to put their programs. It is, nevertheless, useful to reconfigure the machine.

Graphics Modes

Before we launch forth into graphics handling, we must consider the graphics modes available to us. The screen occupies 1000 bytes and is divided into 64000 addressable points or pixels. There are two graphics modes allowing manipulation of the screen.

1. Character Mode

In this default mode, the screen uses 1000 characters, each occupying an 8×8 pixel cell.

2. Bit mapped mode

In this mode, the screen uses a 320 by 200 array of pixels. Using this mode it is possible to create pictures and other images.

The fundamental difference between these modes is that character mode is supported by the operating system whereas bit map mode has no software to drive it. Both modes use 8×8 cells to control the colours used.

In addition to the graphics modes, there are three colour modes.

1. High resolution mode

This is the default graphics mode. In this mode, any given cell may contain only two colours; the background or paper colour and the foreground or ink colour. Any set pixel will have the ink colour and any unset pixel will have the paper colour.

In character mode, the paper colour is held in VIC register 53281 and the ink colour is held in the colour matrix.

This mode allows the greatest detail, albeit at the most limited colour range.

2. Multi-colour Mode

In this mode, pairs of pixels are used to define dots of colour. Since there are four possible arrangements for two pixels, foru colours are allowed in any given character cell (Table 2).

Table 2

Pixel one	Pixel two	Colour Register
clear	clear	53281
clear	set	53282
set	clear	53283
set	set	colour matrix

This mode is a lot coarser but allows greater colour flexibility.

Extended Background

This mode uses high resolution but offers four different paper colours in addition to the usual ink colours. The paper colour is determined by the POKE value of the character used and limits you to 64 different characters (Table 3).

POKE CODE	COLOUR REGISTER
0-63	53281
64-127	53282
128-191	53283
192-255	53284

Redefined characters

OK, we've done the spade work, let's now look at the use of user defined characters.

You will have realised that the shape of characters is held in a table of data. Exactly how is of essence. Consider Figure 2. This shows a character design. The design comprises of eight lines of dots. Imagine that each set pixel is a 1 and each clear pixel is 0. That being so, the top line becomes 00111100. The decimal equivalent of this binary number is 60. Similarly, each line can be converted to a data value. The character table comprises of a sequence of data values for each character. The first eight data values in the table is used by the character normally used by @. The second block of eight is used by the character A. And so on. For any given character CH, its data values start at:

TABLE ADDRESS + CH*8

As an experiment, run Listing 1 as before putting the character table at 51200. Then type in and run Listing 2.

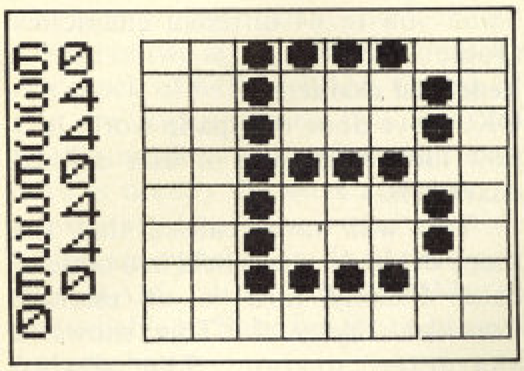
Listing 2

```
10 DATA 60, 34, 34, 60, 34, 34, 60, 0
20 ch=4: FOR I=0T07: READ X
30 POKE 51200+8*CH+1,X
40 NEXT
```

Note what happens to the letter D.

Using this approach is rather slow, Listing 3 gives a machine code alternative.

This code lives at $SC000 allowing you to use a relocated screen and character set as earlier. The code has



two routines. The first copies the ROM characters to a specified address, rather like lines 110 to 150 but faster. You call the routine with the command:

SYS 49152, ADDRESS

Listing 3

```
77  2000 FORL=0TO15:CX=0:FORD=0T
    015:READA:CX=CX+A:POKE49152+
    L*16+D,A:NEXTD
82  2010 READA:IFA<>CXTHENPRINT"
    ERROR IN LINE";2040+(L*10):S
    TOP
0F  2020 NEXTL:END
0D  2040 DATA76,6,192,76,153,192
    ,32,196,192,169,216,141,131,
    3,169,208,2152
C4  2050 DATA141,130,3,169,0,133
    ,253,173,130,3,133,254,165,2
    0,133,251,2091
67  2060 DATA165,21,133,252,141,
    232,3,141,233,3,173,14,220,4
    1,254,141,2167
2C  2070 DATA14,220,165,1,41,251
    ,133,1,160,0,177,253,145,251
    ,165,251,2228
A0  2080 DATA24,105,1,133,251,16
    5,252,105,0,133,252,24,165,2
    53,105,1,1969
85  2090 DATA133,253,165,254,105
    ,0,133,254,165,253,208,222,1
    65,254,205,131,2900
4B  2100 DATA3,208,215,165,1,9,4
    ,133,1,102,21,173,14,220,9,1
    ,1279
D8  2110 DATA141,14,220,173,0,22
    1,41,3,168,173,232,3,56,249,
    149,192,2035
1C  2120 DATA141,232,3,78,232,3,
    78,232,3,173,24,208,41,240,1
    3,232,1933
C7  2130 DATA3,141,24,208,96,192
    ,128,64,0,32,227,192,32,206,
    192,169,1906
D0  2140 DATA0,141,237,3,32,253,
    174,32,138,173,32,247,183,17
    2,237,3,2057
1F  2150 DATA165,20,145,251,200,
    238,237,3,192,8,208,232,96,1
    73,238,3,2409
BE  2160 DATA141,239,3,96,32,253
    ,174,32,138,173,32,247,183,9
    6,6,251,2096
4F  2170 DATA38,252,6,251,38,252
    ,6,251,38,252,24,165,252,109
    ,233,3,2170
E4  2180 DATA133,252,96,32,196,1
    92,165,20,133,251,169,0,133,
    252,96,32,2152
34  2190 DATA144,97,32,134,97,16
    5,20,133,251,173,136,2,24,10
    5,4,133,1650
```

Where ADDRESS is the start of the character table. The routine also remembers where the character table is so always call it first in your program before trying to use the second routine.

The second routine redesigns a specified character and has the form:

SYS 49155,CH,B1,B2,B3,B4,B5,B6,B7,B8

Where CH is the character number and B1 to B8 are the bytes defining the character. To redefine D as B as done earlier, the command is:

SYS 49155,4,60,34,34,60,34,34,60,0

For a bit of a laugh try this one:

```
10SYS 49152,51200
20 FOR I=0TO999: POKE
50176+I,0:NEXT
30 FOR I=0TO7: A(I)=RND(I)*
256: NEXT
40 SYS 49155, 0,A(0),A(1),A(2),A(3),
A(4),A(5),A(6),A(7)
50 GOTO 20
```

Listing 3 works equally well in multicolour and extended background modes. To turn on multicolour character mode you must use:

POKE 53270, PEEK(53270)OR16

To turn it off, use:

POKE 53270, PEEK(53270)AND239

To turn on extended background mode, you must use:

POKE 53265, PEEK(53265)OR64

To turn it off, use:

POKE 53265, PEEK(53265)AND191

Bit Mapped Mode

This mode is a bit of a paradox. Whilst on one hand it offers the greatest scope for artistic creativity, it is also memory hungry. In essence, it uses two or three blocks of memory.

1. The bit map

This is an area of 64000 pixels arranged in 200 lines of 320. This occupies 8K of RAM.

2. The colour array

This holds the colour information and comprises of 1000 character cells.

3. The color matrix

Multicolour mode uses this area to hold one of the colours.-

The concepts discussed earlier with respect to telling the VIC chip where the bit map lies also apply here. Register 53272 holds the details of the bit map area (bits 1 to 3) and the colour array (bits 4 to 7). In other words the bit map occupies the character set area and the colour array occupies the screen memory.

To turn on the bit map, you must turn on bit 5 of register 53265:

POKE 53265, PEEK(53265)OR32

Register 53270 decides whether multicolour or high resolution moces is used:

Multicolour on:POKE 53270, PEEK(53270)OR16
Multicolour off: POKE 53270, PEEK(53270)AND239

So how do we select the colours? In high resolution mode, the colour array holds this information. Each character cell value holds the paper colour in bits 0 to 3 and the ink colour in bits 4 to 7.

In multicolour, colours 1 and 2 are held in the colour array with colour 1 in bits 4 to 7 and colour 2 in bits 0 to 3. Colour 0 is held in register 53281 and colour 3 is held in the colkour matrix. The colours are displayed by the bit combinations:

Colour 0. . .0 0
Colour 1. . .0 1
Colour 2. . .1 0
Colour 3. . .1 1

Since two pixels form a dot in multicolour mode, the horizontal resolution is limited to 160 points.

Any given pixel in the bit map is turned on with the following equations: Assuming that the pixel coordinates are X and Y and the bit map starts at the address BASE.

```
ROW = INT(Y/8)
CHAR = INT(X/8)
LINE = Y AND 7)
BIT = 7-(X AND 7)
BYTE = BASE + ROW * 320 +
CHAR* 8 + LINE
POKE BYTE, PEEK(BYTE) OR
2 ^ BIT
```

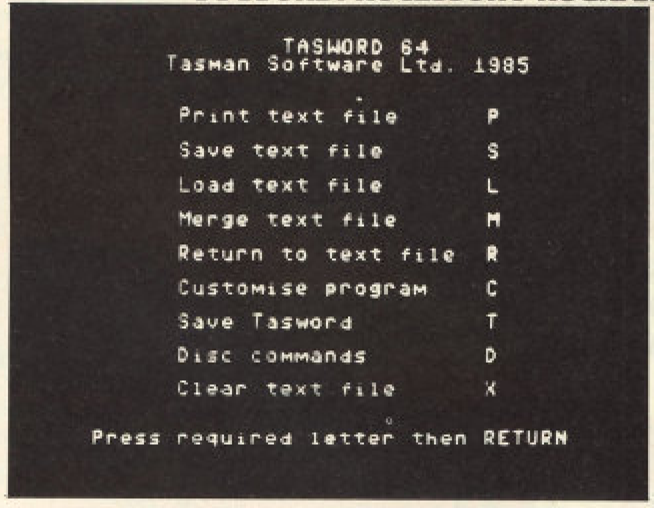
Using bit mapped mode from Basic

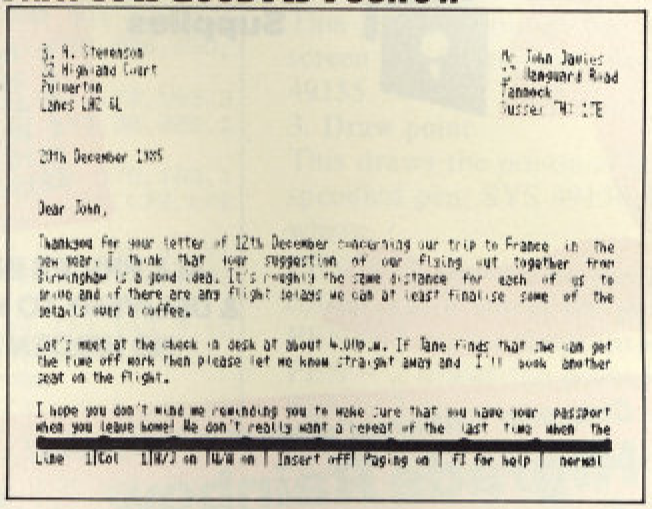


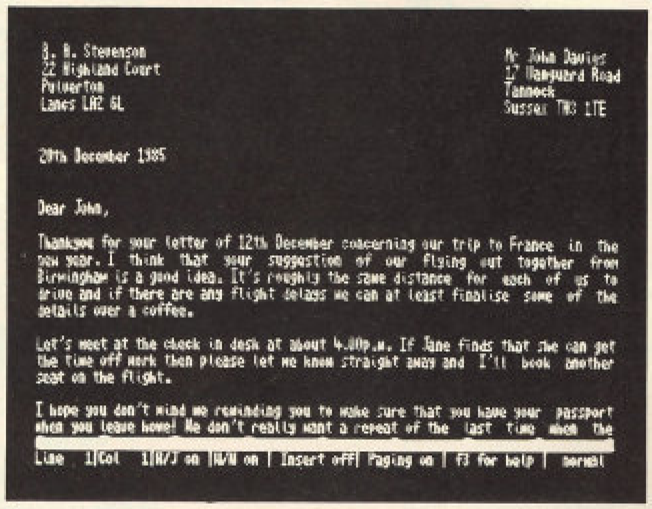
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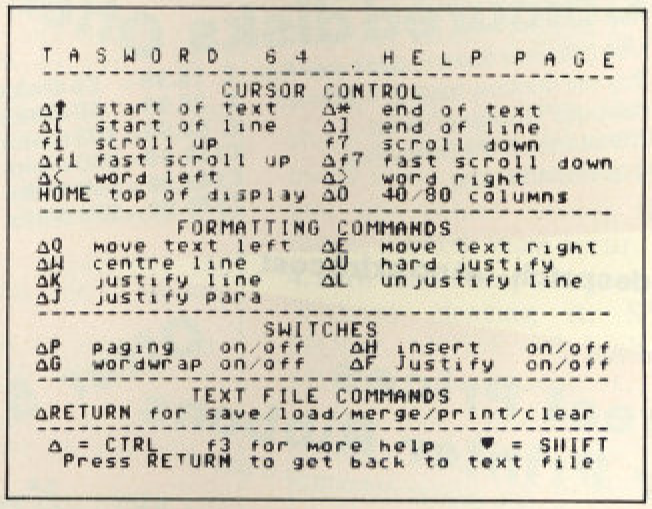
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is slow and over complex. Listing 4 gives a machine code package for handling bit mapped mode.

```
LISTING 4

EE   2000 FORL=0TO45:CX=0:FORD=0T
     O15:READA:CX=CX+A:POKE49152+
     L*16+D,A:NEXTD
B2   2010 READA:IFA<>CXTHENPRINT"
     ERROR IN LINE";2040+(L*10):S
     TOP
0F   2020 NEXTL:END
7E   2040 DATA76,26,192,76,178,19
     2,76,16,193,76,178,194,32,25
     3,174,32,1964
7A   2050 DATA138,173,32,247,183,
     165,20,164,21,96,32,12,192,1
     41,136,3,1755
FC   2060 DATA32,12,192,141,132,3
     ,32,12,192,141,133,3,173,136
     ,3,240,1577
37   2070 DATA20,32,12,192,141,13
     4,3,32,12,192,141,135,3,173,
     136,3,1361
9C   2080 DATA240,3,76,187,194,17
     3,132,3,10,10,10,10,13,133,3
     ,141,1338
E0   2090 DATA137,3,32,133,192,32
     ,218,192,173,2,221,9,3,141,2
     ,221,1711
CE   2100 DATA173,0,221,41,252,9,
     0,141,0,221,173,17,208,9,32,
     141,1638
3E   2110 DATA17,208,169,121,141,
     24,208,173,136,3,240,8,173,2
     2,208,9,1860
68   2120 DATA16,141,22,208,96,16
     9,220,133,169,169,0,133,168,
     32,0,193,1869
D0   2130 DATA173,137,3,162,8,160
     ,127,145,168,136,16,251,72,2
     4,165,168,1915
E1   2140 DATA105,128,133,168,169
     ,0,101,169,133,169,104,202,2
     08,231,32,8,2060
C1   2150 DATA193,96,173,2,221,9,
     3,141,2,221,173,0,221,41,252
     ,9,1757
29   2160 DATA3,141,0,221,173,17,
     208,41,223,141,17,208,169,21
     ,141,24,1748
3F   2170 DATA208,173,22,208,41,2
     39,141,22,208,96,169,224,133
     ,169,169,0,2222
70   2180 DATA133,168,169,0,162,6
     4,160,127,145,168,136,16,251
     ,72,24,165,1960
D2   2190 DATA168,105,128,133,168
     ,169,0,101,169,133,169,104,2
     02,208,231,96,2284
5A   2200 DATA120,165,1,41,249,13
     3,1,96,165,1,9,6,133,1,88,96
     ,1305
A3   2210 DATA32,12,192,141,138,3
     ,140,139,3,32,12,192,141,147
     ,3,32,1359
FD   2220 DATA12,192,141,140,3,17
     3,136,3,240,3,76,235,193,32,
     77,193,1849
20   2230 DATA32,133,194,32,0,193
     ,173,147,3,160,0,174,140,3,2
     40,6,1630
55   2240 DATA32,166,194,76,73,19
     3,32,171,194,32,8,193,96,173
     ,147,3,1783
03   2250 DATA74,74,74,141,141,3,
     173,139,3,74,173,138,3,106,7
     4,74,1464
BB   2260 DATA141,142,3,173,147,3
     ,41,7,141,145,3,173,141,3,14
     1,143,1547
01   2270 DATA3,169,0,141,144,3,1
     62,6,32,220,193,202,208,250,
     173,144,2050
27   2280 DATA3,133,171,173,143,3
     ,133,170,32,220,193,32,220,1
     93,24,173,2016
2B   2290 DATA143,3,101,170,133,1
     70,173,144,3,101,171,133,171
     ,169,0,141,1926
B2   2300 DATA144,3,173,142,3,141
     ,143,3,32,220,193,32,220,193
     ,32,220,1894
90   2310 DATA193,24,173,143,3,10
     1,170,133,170,173,144,3,101,
     171,133,171,2006
4B   2320 DATA24,173,145,3,101,17
     0,133,170,169,0,101,171,133,
     171,24,169,1857
E9   2330 DATA0,101,170,133,170,1
     69,224,101,171,133,171,96,16
     9,0,14,144,1966
BC   2340 DATA3,14,143,3,109,144,
     3,141,144,3,96,14,138,3,46,1
     39,1143
B5   2350 DATA3,173,138,3,141,148
     ,3,173,139,3,141,149,3,173,1
     47,3,1540
54   2360 DATA141,150,3,173,140,3
     ,240,19,201,1,240,26,201,2,2
     40,33,1813
72   2370 DATA169,1,32,60,194,169
     ,1,32,60,194,96,169,0,32,60,
     194,1463
FE   2380 DATA169,0,32,60,194,96,
     169,0,32,60,194,169,1,32,60,
     194,1462
A0   2390 DATA96,169,1,32,60,194,
     169,0,32,60,194,96,141,151,3
     ,173,1571
C6   2400 DATA148,3,141,138,3,173
     ,149,3,141,139,3,173,150,3,1
     41,147,1655
F0   2410 DATA3,32,77,193,32,133,
     194,32,0,193,173,147,3,160,0
     ,174,1546
95   2420 DATA151,3,240,6,32,166,
     194,76,109,194,32,171,194,32
     ,0,193,1793
B9   2430 DATA24,173,148,3,105,1,
     141,148,3,173,149,3,105,0,14
     1,149,1466
B6   2440 DATA3,32,8,193,96,173,1
     38,3,41,7,141,146,3,56,169,7
     ,1216
BC   2450 DATA237,146,3,141,146,3
     ,24,169,1,174,146,3,240,4,10
     ,202,1649
0E   2460 DATA208,252,141,147,3,9
     6,17,170,145,170,96,73,255,4
     9,170,145,2137
D6   2470 DATA170,96,32,12,192,14
     1,136,3,76,88,192,173,132,3,
     141,33,1620
F1   2480 DATA208,173,135,3,141,1
     34,2,169,147,32,210,255,173,
     133,3,10,1928
10   2490 DATA10,10,10,13,134,3,7
     6,79,192,191,0,191,0,191,0,1
     91,1291
```

This code starts at 49152 and has three routines.

1. Activate bit map

This clears the bit map, set up the colours and turns on bit map mode. It has two forms:

High resolution mode: SYS 49152,0,C1,C2.

C1 = paper colour, C2 = ink colour.

Multicolour mode: SYS 49152,1,C0, C1,C2,C3.

C0 = paper colour

2.Return to text mode.

This returns you to the normal text screen at its normal position, SYS 49155.

3. Draw point

This draws the points at X,Y with the specified pen: SYS 49158,X,Y,PEN where:

PEN = 0 draws the point in paper colour, i.e. it erases the point.
PEN = 1 draws the point in ink 1.
PEN = 2 draws the point in ink 2.
PEN = 3 draws the point in ink 3.

In high resolution mode, X must be in the range 0 to 319. In multicolour mode, X must be in the range 0 to 159. In either mode, Y must be in the range 0 to 199.

In order to keep the routine as short as possible. I have omitted any range checking of the co-ordinates. If you use values outside the allowed range, a crash may occur.

4.Turn on bit map.

Without clearing it: SYS 49161, MODE. MODE = 0, high resolution. MODE = 1, multicolour.

So that you don't loose any memory for Basic, the bit map is placed behind the Kernal ROM and interface chip.

Listing 5 is a simple demonstration.

LISTING 5

```
A0   10 SA=12*4096
B4   20 SYS SA,1,15,11,12,0
82   30 X1=5:Y1=5:X2=30:Y2=30:PA=
     1:GOSUB1000
89   40 X1=10:Y1=10:X2=20:Y2=20:P
     A=2:GOSUB1000
13   50 X1=27:Y1=1:X2=35:Y2=50:PA
     =3:GOSUB1000
C6   60 FOR X = 0 TO 50
24   70 SYS SA+6,X+O,X,RND(1)*4:N
     EXT X
FA   80 O=O+1:IFO<10THEN60
DA   90 END
30   1000 FOR Y=Y1TOY2
79   1010 FOR X=X1TOX2
4D   1020 SYS SA+6,X,Y,PA
45   1030 NEXT X,Y
9A   1040 RETURN
```

Sprites

Sprites are probably the thing which makes games writer's lives simplest. To those of you who don't know, a spriate is a moveable block of 504 pixels arranged in a block of 21 rows of

24. The design is stored in a similar way to characters in that each row can be represented by 3 bytes with the whole design occupying 63 bytes. These designs are stored as a sequence of blocks in any given bank. The address of any given sprite block is given by:

ADDRESS = (BANK*16384) + (BLOCK NO*64)

Specifying a sprite design

The next step is to tell the VIC which pattern block is to be used. A maximum of eight sprites are possible and each has a pointer. These pointers are located above the screen memory and can be found by:

POINTER ADDRESS = SCREEN ADDRESS + 1014 + SPRITE NO

where SPRITE NO is from 0 to 7

A power up, the screen sits at 1024 so the pointer for sprite 3 is at 1024+1014+3 or 2043. To tell the VIC which pattern to use, you simply POKE the block number into the pointer, eg to set sprite 1 to pattern 43:

POKE 2041, 43

Turning on a Sprite

Whether or not a sprite is visible is determined by VIC register 53269. Each bit of this register controls a sprite. To activate sprite SP use:

POKE 53269, PEEK(53269) OR (2 ^SP)

To turn off sprite SN use:

POKE 53269, PEEK(53269) AND 255-2 ^SP)

Expanded Sprites

Sprites can be expanded in both directions to give four possible sizes. These are controlled by two registers. To expand sprite SP in the X direction use:

POKE 53277,PEEK(53277) OR (2 ^SP)

To reduce it again use:

POKE 53277,PEEK(53277) AND (255-2 ^SP)

To expand sprite SP in the Y direction use:

POKE 53271, PEEK(53271) OR (2 ^SP)

To reduce it again use:

POKE 53271,PEEK(53271) AND (255-2 ^SP)

Colours

Each sprite has a colour register. This is given by:
REGISTER = 53287 + SPRITE NO

This is used to specify the colour of high resolution sprites

In multicolour sprites the colours are selected by the usual bit pairs, see Table 3.

The eight bits in register 53276 control the colour mode.

To set a sprite SP to multicolour mode use:

POKE 53276, PEEK(53276) OR (2 ^SP)

To set sprite SP to high resolution mode use:

POKE 53276, PEEK(53276) AND (255-2 ^SP)

Positioning a Sprite

The positioning of any given sprite on the screen is defined by its X,Y co-ordinates. The X co-ordinate can range from 0 to 512 and Y co-ordinate from 0 to 256. Each sprite has a dedicated pair of registers. The first holds part of the X position and the other holds the Y co-ordinates. They can be found from:

X Register = 53248 + SN*2

and the Y register is found from:

Y Register = 53249 + SN*2

The X position is defined in two parts:

Most significant byte (msb) = INT(XPOS/256)

Least significant byte (lsb) = XPOS-msb*256

Register 53264 holds the msb details, one bit per sprite

So to position a sprite you use:

POKE XREG,LSB
POKE YREG,Y

If msb=1 then POKE 53264, PEEK(53264) OR 2 ^SP).
If msb=0 then POKE 53264, PEEK(53264) AND (255-2 ^SP).

Priorities

Each sprite has a priority which decides ehtther it appears in front of or behind the characters on the screen. Register 53275 decides this, one bit per sprite

To put sprite SP behind the characters use:

POKE 53275, PEEK(53275) OR (2 ^SP)

To put sprite SP in front of the characters use:

POKE 53275, PEEK(53275) AND (255-2 ^SP)

That's quite a mouthful and hardly conducive to simple programming. Listing 6 gives the ubiquitous machine code package.

This code has four routines.

Setup Sprite

SYS 49408,SP,TYPE,COLOUR, XEXP,PRIORITY,(COLOUR1, COLOUR2)

where: SP sprite number (0 t0 7).
TYPE-0=High resolution, 1=Multi-colour.
COLOUR - High resolution colour.
XEXP - 1= X direction, o=don't expand X direction.
YEXP - 1=expand Y direction, 0=don't expand y direction.
PRIORITY-1=behind background,

Table 4.

BIT PAIR	COLOUR SOURCE
0 0	Screen colour
0-1	Register 53285
1 0	Colour register
1 1	Register 53286

Selecting Colour Mode

```
62  2000 FORL=0TO30:CX=0:FORD=0T
    O15:READA:CX=CX+A:POKE49408+
    L*16+D,A:NEXTD
B2  2010 READA:IFA<>CXTHENPRINT"
    ERROR IN LINE";2040+(L*10):S
    TOP
0F  2020 NEXTL:END
F1  2040 DATA76,194,194,76,12,19
    3,76,66,193,76,241,193,32,14
    4,194,32,1992
C3  2050 DATA134,194,165,20,41,1
    ,240,13,172,133,3,185,50,193
    ,13,21,1578
F0  2060 DATA208,141,21,208,96,1
    72,133,3,185,58,193,45,21,20
    8,141,21,1854
AD  2070 DATA208,96,1,2,4,8,16,3
    2,64,128,254,253,251,247,239
    ,223,2026
C3  2080 DATA191,127,32,144,194,
    32,134,194,165,20,164,21,141
    ,134,3,140,1836
3E  2090 DATA135,3,32,134,194,16
    5,20,141,136,3,173,133,3,24,
    10,168,1474
B3  2100 DATA173,134,3,153,0,208
    ,173,136,3,200,153,0,208,173
    ,135,3,1855
D1  2110 DATA240,13,172,133,3,18
    5,50,193,13,16,208,141,16,20
    8,96,172,1859
3B  2120 DATA133,3,185,58,193,45
    ,16,208,141,16,208,96,41,1,2
    40,13,1597
F4  2130 DATA172,133,3,185,50,19
    3,13,28,208,141,28,208,96,17
    2,133,3,1766
6B  2140 DATA185,58,193,45,28,20
    8,141,28,208,96,32,134,194,1
    65,20,41,1776
0B  2150 DATA1,240,15,172,133,3,
    185,50,193,13,29,208,141,29,
    208,76,1696
57  2160 DATA206,193,172,133,3,1
    85,58,193,45,29,208,141,29 2
    08,32,134,1969
8B  2170 DATA194,165,20,41,1,240
    ,13,172,133,3,185,50,193,13,
    23,208,1654
1F  2180 DATA141,23,208,96,172,1
    33,3,185,58,193,45,23,208,14
    1,23,208,1860
CA  2190 DATA96,32,144,194,32,13
    4,194,165,20,133,251,173,136
    ,2,24,105,1835
D3  2200 DATA4,133,254,169,0,133
    ,253,56,165,253,233,8,133,25
    3,165,254,2466
F1  2210 DATA233,0,133,254,172,1
    33,3,165,251,145,253,96,192,
    128,64,0,2222
85  2220 DATA32,134,194,165,20,4
    1,1,240,13,172,133,3,185,50,
    193,13,1589
54  2230 DATA27,208,141,27,208,9
    6,172,133,3,185,58,193,45,27
    ,208,141,1872
60  2240 DATA27,208,96,32,159,19
    4,169,0,141,142,3,32,95,194,
    172,142,1806
6C  2250 DATA3,145,253,200,192,6
    4,240,6,140,142,3,76,75,194,
    96,169,1998
15  2260 DATA255,141,14,212,141,
    15,212,169,128,141,18,212,16
    9,128,141,24,2120
A6  2270 DATA212,173,27,212,96,3
    2,134,194,165,20,141,37,208,
    32,134,194,2011
2D  2280 DATA165,20,141,38,208,9
    6,32,253,174,32,138,173,32,2
    47,183,96,2028
9B  2290 DATA32,134,194,165,20,2
    01,8,144,2,169,7,141,133,3,9
    6,32,1481
8D  2300 DATA134,194,165,20,133,
    253,169,0,133,254,162,6,6,25
    3,38,254,2174
5D  2310 DATA202,208,249,173,0,2
    21,41,3,168,185,28,194,24,10
    1,254,133,2184
09  2320 DATA254,96,32,144,194,3
    2,134,194,165,20,141,141,3,3
    2,140,193,1915
7F  2330 DATA32,134,194,165,20,1
    72,133,3,153,39,208,32,170,1
    93,32,32,1712
52  2340 DATA194,173,141,3,240,3
    ,32,117,194,96,133,3,96,32,2
    28,255,1940
```

0=in front of background.
COLOUR1 – Multicolour 1, only needed if TYPE =1.
COLOUR2 – Multicolour 2, only needed if TYPE=1.

Switch on

SYS 49411,SP,FLAG where:

FLAG=1 – turn on sprite SP.
FLAG=0 – turn off sprite SP.

Sprite position
SYS 49414,SP,X,Y where:
SP – sprite number.
X – X position.
Y – Y position.

Pattern
SYS 49417,SP,DESIGN, BLOCK

The routine is quite smart in that it sorts out which bank you are using and where the sprite pointers are. I therefore recommend that you use the configuration used earlier (screen at 50176 and characters at 51200. This allows you a block of 128 sprites from design block 128 to 255.

In Summary
In all, this has been a hefty slab of information and I must apologise for not giving more detail. If you want to really get into grphics you must invest in the Programmers Reference Guide or something similar. Havins said that, I believe that the routines I've given will be useful tools. YC

Sprite Editor

Any serious games programmer needs a sprite editor to aid design. This program should make working with sprites easier and more effective.

By Brian Rhodes

Serious programmers are always looking for new utilities to enable them to improve on their finished product. A sprite editor is an invaluable asset when it comes to designing and manipulating sprites. Here we present an editor which we hope will answer all your needs.

Instructions

F: Function
SH: Shifted
m/c: Multi-colour mode.
CRSR Keys: Move cursor.
SPACES: Plot/unplot. In m/c mode Plots normal colour but unplots all colours.
1: Plots sprite colour regardless of m/c mode.
2: Plots m/c #0 in m/c mode only.
3: Plots m/c #1 in m/c mode only.
DEL: Unplots all colours (Any mode).

The shifted version of the above also work so shift lock can be used.

+: Next sprite
—: Previous sprite.
0: Delay before + or —, (used in animation).
+: Increases delay.
—: Reduces delay.
£: Jump forward 10 sprites.
Shift £: Jump back 10 sprites.
P: Progress (copies present sprite to next location and advances).
A: Auto advance CRSR.
CLR shifted: Erase sprite.
HOME: Home CRSR.
R: Restart (return to menu).
Q: Quit (return to Basic.SYS49152/24576 RETURN restarts).
@: Scroll mode. Use CRSR keys to position sprite. SPACE exits.
F: Fill sprite.
: Flip (reverse around horizontal axis).
: Mirror (reverse around vertical axis).
=: Equalise, because of the nature of sprites mirroring ( ) m/c sprites spoils the colours. Pressing '=' restores the correct colours.
C: Copy sprite.
F7: Toggle between m/c and normal mode.
*: Change colours.
F1: Background/border colour.
F3: Sprite colour.
F5: m/c #0 (only in m/c mode).
F7: m/c #1 (only in m/c mode). Also see note in multi sprite mode.
Shifted F-keys step backwards.
D: Data output
F1: Disk storage.
F3: Printout.
F5: Numerical Printout.
F8: Sprite printout (normal mode only).
K: Kill sprite advance. Toggles modes A,B and off.
Off: All sprites follow grid
A: Only one sprite follows grid
B: No sprites follow grid.
M: Multi-sprite mode. Enables objects of several sprites to be constructed.
SPACES: Exit mode.
CRSR Keys: Move sprite.
Numbers 1-7: Change controlled sprite.
F2: Enbales sprites 5,6 & 7.
F7: Toggle m/c and normal mode.
+: Next sprite.
—: Previous sprite.
<: Increment colour.
>: Decrement colour. (Don't shift and)
↑: Expand vertically.
←: Expand horizontally.

Notes

1) All numbers wrap-round i.e. when they get to 255 they revert to 0 (and the other way), or at 15 when using colours.
2) Entering null values (0 or "") normally exits present mode.
3) When using multi sprites be careful that colour change and mode change do not spoil multi sprite parameters.

Additional Notes

These are some additional notes on the use of the Sprite Editor. They are meant to supplement and expand upon the instructions and explain in detail all available functions.

There are two forms of the sprite editor provided, each occupying a different area of memory

1) Entitled 'SPRITE ED.$6000' (29 blocks), this is a single file version loading from $6000 to $9400 and is run by the command 'SYS 24576 < RETURN > ($6000).
2) Entitled 'CODE 1 C000-D000' (17 blocks) and 'CODE 2 6800-7C00' (13 blocks), this is a two file version loading between $6800-$7C00 and $C000-$D000 and is run by the command 'SYS 49152 <RETU-RN> '($C000).

Parameter Screen

When the Program is run, the first thing that will be seen is the parameter screen. The screen will clear and the words 'PARAMETER INPUT' will appear at the top of the screen along with a copyright message. You will then be asked to input a number of variables such as Colour, Start Sprite etc. and a cursor will appear beside t he present value, if this value is correct then just press Return, if not then use delete and the numerical keys to change it. The questions that will be asked are as follows:

1. Start Sprite: This is the sprite that will first appear on the screen. Sprite numbers are identical to the number POKE'd to 2048 to display sprites normally. It is inadvisable to use sprites below 128 but for more information see the Commodore manual.

2. Background Colour: This is the colour of the background on which the sprites will be displayed.

3. Normal Mode Colour 1: This is the colour of any hi-res sprite.

4. M/C mode Colour 1: This is the colour that will be given to any multi-coloured sprite as its basic colour.
M/Colour # 0: This is the colour that will be given to m/c # 0 of any multi-coloured sprite.

M/colour # 1: Likewise for m/c 1
5. Advance/Retreat Interval: This determines the number of sprites that will be advanced or retreated for every press of + or –.

6. Highest Sprite Before Wrapround: When on this sprite press + and the program will go to the Lowest sprite.

7. Lowest Sprite Before Wrapround: When on this sprite, Press – and program will go to the Highest sprite.

If 5, 6 or 7 are given such values as to be impossible the program will return to question 5.

Editing Screen

When all six variables have been defined the editing screen will appear. This can be split into three sections.

i) The editing grid.
ii) The sprite display area.
iii) The control/input line.

The editing grid is a block of squares on the left of the screen which displays an enlarged version of the current sprite. A flashing cursor will also appear on the grid and this indicates the position of any change to the sprite.

To the right of this is a space coloured according to the background colour. It is on this space that the defined sprites appear.

The top line and the space above the display area is the control/input area whee instructions or requests will appear.

The standard editing commands are given in the instructions. Most of the commands are straight-forward but for the more complicated ones a more detailed description is given below.

0 – This controls the time interval between changing the sprite number and control being returned to the keyboard. This is useful in animating sprites when the upper and lower sprite wrapround limits can be set to the limits of the animated sprite and + or – is held down to cycle through the images. Varying the delay value changes the speed of the animation. 0 is the minimum delay, 255 the maximum.

A – Cursor auto advance. This allows a preset cursor movement after any point has been plotted. When selected a 9 point grid will appear and below this is the present value. The keys 0 to 8 now select the direction of the advance. Any UNPLOT command will act in the opposite direction. A value of 0 turns auto advance off.

f8 – Sprite print-out. Pressing this key will print out the currently edited sprite on an MPS803 printer. The printout will be in normal hi-res mode only.

D – Data output. Pressing this gives access to a sub menu.

Q – Quit mode.

f1 – Data storage on disk. This gives access to a standard Load/Save facility.

f3 – Display. This gives a numerical screen display of the data that goes to make up a particular sprite.

f5 – Numerical print-out. This is the same as above but to printer (MPS803).

Multi Sprite Mode

It is possible using the editor to create images using more than one sprite. To do this the sprite advance mechanism must be turned off. This prevents the sprites from changing when + or – is pressed and is achieved by pressing K to enter 'Kill mode'. An A will appear at the top of the screen. Press K again and B will appear. Pressing it a third time will make the latter disappear.

Kill mode A means that only sprite number one will follow the main grid and in kill mode B no sprites will follow the grid.

The number keys 1-7 change between sprites and the cursor keys move them. SPACE turns the sprite on or off and UP ARROW and BACK ARROW expand the sprite in the x and y directions. (,) and (.) change the sprite colours whilst + and – change sprite numbers and f7 changes between m/c and normal mode.

Normally only four sprites are visible but pressing f2 brings the other sprites on. Use f2 once only because pressing it again will reset the positions of sprites 5, 6 and 7.

N.B. When using multi-sprite mode, be very careful about changing mode and colours of the sprites since it will affect all sprites and may destroy the layout. YC

Please read LISTINGS before entering any programs.

PROGRAM: SPRITE LOADER 1

```
CE  1 REM TO CREATE SPRITE EDITO
    R LOAD AND
1F  2 REM RUN THIS PROGRAM THEN
    LOAD AND RUN
EC  3 REM SPRITE LOADER 2. NOW L
    OAD AND RUN
DF  4 REM EDITOR SAVE TO CREATE
    WORKING
00  5 REM WORKING VERSION OF THE
     EDITOR
CC  10 BL=255  :LN=50   :SA=4915
    2
5B  20 FOR L=0 TO BL:CX=0:FOR D=
    0 TO 15:READ A:CX=CX+A:POKE
    SA+L*16+D,A:NEXT D
A5  30 READ A:IF A><CX THENPRINT
    "ERROR IN LINE";LN+(L*10):ST
    OP
40  40 NEXT L:END
92  50 DATA 76,80,194,76,93,199,
    76,90,199,76,108,197,76,64,1
    99,76,1879
14  60 DATA 201,197,0,169,40,133
    ,167,169,4,133,168,169,40,13
    3,169,169,2061
66  70 DATA 216,133,170,32,107,1
    92,32,129,192,162,0,160,0,32
    ,119,192,1868
F1  80 DATA 160,25,32,119,192,32
    ,129,192,232,224,21,208,238,
```

```
    32,107,192,2135
54  90 DATA 173,44,199,141,134,2
    ,162,5,169,18,32,210,255,24,
    160,26,1754
98  100 DATA 32,240,255,160,14,1
    69,32,32,210,255,136,208,248
    ,232,224,24,2471
30  110 DATA 208,235,162,0,160,0
    ,24,32,240,255,96,160,0,169,
    160,32,1933
3B  120 DATA 119,192,200,192,25,
    208,246,169,160,145,167,173,
    44,199,145,169,2553
36  130 DATA 96,24,165,167,105,4
    0,133,167,165,168,105,0,133,
    168,24,165,1825
E1  140 DATA 169,105,40,133,169,
    165,170,105,0,133,170,96,169
    ,40,133,167,1964
1D  150 DATA 169,4,133,168,169,4
    0,133,169,169,216,133,170,32
    ,129,192,230,2256
6B  160 DATA 167,230,169,169,128
    ,141,77,194,160,0,132,253,13
    2,254,164,253,2623
6B  170 DATA 177,251,45,77,194,2
    40,5,169,160,76,206,192,169,
    76,164,254,2455
9C  180 DATA 145,167,173,45,199,
    145,169,230,254,200,24,110,7
    7,194,144,222,2498
13  190 DATA 110,77,194,230,253,
    192,24,208,213,165,253,201,6
    3,240,10,169,2602
A9  200 DATA 0,133,254,32,129,19
    2,76,190,192,24,160,5,162,0,
    32,240,1821
12  210 DATA 255,169,6,141,134,2
    ,189,20,193,32,210,255,232,2
    24,25,208,2295
C6  220 DATA 245,76,45,193,146,3
    2,32,32,32,18,78,79,82,77,65
    ,76,1308
2B  230 DATA 146,32,32,32,32,32,
    32,157,157,157,157,157,32,17
    3,18,192,1538
15  240 DATA 240,6,24,105,64,32,
    210,255,24,160,26,162,0,32,2
    40,255,1835
02  250 DATA 189,83,193,32,210,2
    55,232,224,18,208,245,166,15
    1,169,0,32,2407
92  260 DATA 205,189,96,83,80,82
    ,73,84,69,32,78,79,32,32,32,
    32,1278
35  270 DATA 32,157,157,157,157,
    169,81,141,200,193,169,4,141
    ,201,193,169,2321
FE  280 DATA 81,141,205,193,169,
    216,141,206,193,169,0,133,25
    3,133,254,141,2628
A7  290 DATA 78,194,164,253,177,
    251,141,77,194,164,254,173,7
    7,194,41,192,2624
72  300 DATA 208,8,169,76,174,46
    ,199,76,183,193,201,192,240,
    8,201,128,2302
53  310 DATA 240,10,201,64,240,1
    2,174,48,199,76,181,193,174,
    46,199,76,2133
48  320 DATA 181,193,174,47,199,
    169,160,32,199,193,201,76,20
    8,2,169,111,2314
71  330 DATA 200,32,199,193,76,2
    10,193,153,0,144,72,138,153,
    0,144,170,2077
FD  340 DATA 104,96,230,254,230,
    254,238,78,194,238,78,194,46
    ,77,194,46,2551
E0  350 DATA 77,194,173,78,194,2
    01,8,208,160,169,0,141,78,19
    4,230,253,2358
8D  360 DATA 165,253,201,63,240,
    47,165,254,201,24,208,134,24
    ,173,200,193,2545
78  370 DATA 105,40,141,200,193,
    173,201,193,105,0,141,201,19
    3,24,173,205,2288
8B  380 DATA 193,105,40,141,205,
    193,173,206,193,105,0,141,20
    6,193,169,0,2263
77  390 DATA 133,254,76,130,193,
    24,162,0,160,7,32,240,255,18
    9,59,194,2108
9E  400 DATA 32,210,255,232,224,
    16,208,245,76,45,193,31,18,7
    7,85,76,2023
7D  410 DATA 84,73,32,67,79,76,7
    9,85,82,146,32,32,157,0,0,0,
    1024
2B  420 DATA 32,68,229,169,8,32,
    210,255,169,0,141,21,208,169
    ,14,141,1866
88  430 DATA 33,208,169,6,141,32
    ,208,169,1,141,134,2,162,0,1
    89,62,1657
1B  440 DATA 197,157,64,3,232,22
    4,36,208,245,169,0,157,64,3,
    232,224,2215
A5  450 DATA 63,208,248,162,0,18
    9,98,197,157,0,208,232,224,1
    0,208,245,2449
AA  460 DATA 169,62,141,16,208,1
    69,20,141,29,208,169,24,141,
    23,208,169,1897
31  470 DATA 13,141,248,7,120,16
    9,142,141,20,3,169,197,141,2
    1,3,88,1623
61  480 DATA 169,128,133,151,32,
    5,195,169,31,141,21,208,173,
    45,199,141,1941
67  490 DATA 40,208,141,41,208,1
    41,42,208,141,43,208,165,151
    ,141,249,7,2134
EB  500 DATA 141,250,7,141,251,7
    ,141,252,7,169,0,141,39,208,
    32,108,1894
67  510 DATA 197,169,0,141,60,19
    9,169,0,141,62,199,141,63,19
    9,173,47,1960
51  520 DATA 199,141,37,208,173,
    48,199,141,38,208,169,0,141,
    28,208,32,1970
E8  530 DATA 68,229,76,90,199,32
    ,68,229,162,0,189,250,195,24
    0,7,32,2066
63  540 DATA 210,255,232,76,10,1
    95,162,0,189,85,196,240,7,32
    ,210,255,2354
9E  550 DATA 232,76,24,195,165,1
    51,32,201,197,133,151,162,0,
    189,104,196,2208
B7  560 DATA 240,7,32,210,255,23
    2,76,45,195,173,44,199,32,20
    1,197,141,2279
8B  570 DATA 44,199,162,0,189,12
    3,196,240,7,32,210,255,232,7
    6,68,195,2228
3D  580 DATA 173,45,199,32,201,1
    97,141,45,199,162,0,189,152,
    196,240,7,2178
50  590 DATA 32,210,255,232,76,9
    1,195,173,46,199,32,201,197,
    141,46,199,2325
E5  600 DATA 162,0,189,187,196,2
    40,7,32,210,255,232,76,114,1
    95,173,47,2315
82  610 DATA 199,32,201,197,141,
    47,199,162,0,189,201,196,240
    ,7,32,210,2253
78  620 DATA 255,232,76,137,195,
    173,48,199,32,201,197,141,48
    ,199,162,0,2295
50  630 DATA 189,250,195,240,7,3
    2,210,255,232,76,160,195,162
    ,0,189,215,2607
A3  640 DATA 196,240,7,32,210,25
    5,232,76,174,195,173,55,199,
    32,201,197,2474
41  650 DATA 141,55,199,162,0,18
    9,244,196,240,7,32,210,255,2
    32,76,197,2435
37  660 DATA 195,173,56,199,32,2
    01,197,141,56,199,162,0,189,
    25,197,240,2262
C2  670 DATA 7,32,210,255,232,76
    ,220,195,173,57,199,32,201,1
    97,141,57,2284
3A  680 DATA 199,173,57,199,205,
    56,199,176,165,96,147,29,29,
    29,29,29,1817
8D  690 DATA 29,29,29,29,29,29,2
    9,80,65,82,65,77,69,84,69,82
    ,876
2F  700 DATA 32,32,73,78,80,85,8
    4,13,29,29,29,29,29,29,29,29
    ,709
51  710 DATA 29,29,29,29,197,197
    ,197,197,197,197,197,197,197
    ,197,197,197,2480
34  720 DATA 197,197,197,197,13,
    29,29,29,29,29,29,29,29,29,4
    0,67,1169
65  730 DATA 41,32,49,57,56,54,3
    2,66,82,73,65,78,32,82,72,79
    ,950
18  740 DATA 68,69,83,13,0,17,17
    ,29,29,29,83,84,65,82,84,32,
    784
3C  750 DATA 83,80,82,73,84,69,3
    2,0,17,29,29,29,66,79,82,68,
    902
BD  760 DATA 69,82,32,67,79,76,7
    9,85,82,32,0,17,29,29,78,79,
    915
70  770 DATA 82,77,65,76,32,77,7
    9,68,69,13,17,29,29,29,67,79
    ,888
D5  780 DATA 76,79,85,82,32,49,3
    2,0,17,29,29,77,85,76,84,73,
    905
75  790 DATA 32,67,79,76,79,85,8
    2,32,77,79,68,69,13,17,29,29
    ,913
B4  800 DATA 29,67,79,76,79,85,8
    2,32,49,32,0,13,29,29,29,77,
    787
7A  810 DATA 47,67,79,76,32,35,4
    8,32,0,13,29,29,29,77,47,67,
    707
C4  820 DATA 79,76,32,35,49,32,0
    ,13,17,29,29,65,68,86,65,78,
    753
32  830 DATA 67,69,47,82,69,84,6
    5,82,68,32,73,78,84,69,82,86
    ,1137
C7  840 DATA 65,76,29,0,13,29,29
    ,72,73,71,72,69,83,84,32,83,
    880
9F  850 DATA 80,82,73,84,69,32,6
    6,69,70,79,82,69,32,87,82,65
    ,1121
8A  860 DATA 80,45,82,79,85,78,6
    8,29,0,13,29,29,76,79,87,69,
    928
32  870 DATA 83,84,32,32,83,80,8
    2,73,84,69,32,66,69,70,79,82
    ,1100
61  880 DATA 69,32,87,82,65,80,4
    5,82,79,85,78,68,29,0,0,0,88
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     1
D2   890 DATA 0,0,0,0,0,0,0,6,0,0
     ,7,128,0,3,224,0,368
30   900 DATA 3,240,0,1,224,0,1,2
     40,0,0,152,0,0,12,0,0,873
72   910 DATA 4,0,32,66,24,96,12,
     124,24,152,12,200,165,151,13
     3,251,1446
C7   920 DATA 169,0,133,252,24,38
     ,251,38,252,38,251,38,252,38
     ,251,38,2063
A9   930 DATA 252,38,251,38,252,3
     8,251,38,252,38,251,38,252,9
     6,173,49,2307
B5   940 DATA 199,208,27,72,152,7
     2,172,50,199,185,177,197,201
     ,255,208,4,2378
EF   950 DATA 160,255,169,0,141,3
     9,208,200,140,50,199,104,168
     ,104,76,49,2062
B2   960 DATA 234,11,11,12,12,15,
     15,1,1,1,1,1,1,15,15,12,358
3B   970 DATA 12,11,11,0,0,0,0,0,
     255,162,3,142,54,199,160,0,1
     009
4F   980 DATA 201,100,176,19,201,
     10,144,7,202,142,54,199,76,2
     55,197,202,2185
0A   990 DATA 202,142,54,199,76,2
     3,198,162,0,56,233,100,144,4
     ,232,76,1901
E6   1000 DATA 233,197,141,79,194
     ,138,153,51,199,200,173,79,1
     94,105,100,162,2398
0E   1010 DATA 0,56,233,10,144,4,
     232,76,1,198,141,79,194,138,
     153,51,1710
74   1020 DATA 199,200,173,79,194
     ,105,10,162,0,56,233,1,144,4
     ,232,76,1868
1D   1030 DATA 25,198,138,153,51,
     199,160,0,185,51,199,24,105,
     48,153,51,1740
AA   1040 DATA 199,32,210,255,200
     ,204,54,199,208,238,169,164,
     32,210,255,169,2798
C2   1050 DATA 64,141,138,2,32,22
     8,255,240,246,201,13,240,78,
     201,20,240,2339
83   1060 DATA 40,201,48,144,234,
     201,58,176,230,172,54,199,19
     2,3,240,223,2415
D2   1070 DATA 153,51,199,169,157
     ,32,210,255,185,51,199,32,21
     0,255,169,164,2491
71   1080 DATA 32,210,255,238,54,
     199,76,63,198,173,54,199,240
     ,193,206,54,2444
09   1090 DATA 199,169,157,32,210
     ,255,32,210,255,169,164,32,2
     10,255,169,32,2550
8A   1100 DATA 32,210,255,169,157
     ,32,210,255,76,63,198,173,54
     ,199,201,3,2287
0D   1110 DATA 240,23,32,26,199,1
     73,54,199,201,2,240,13,32,26
     ,199,173,1832
B1   1120 DATA 54,199,201,1,240,3
     ,32,26,199,173,54,199,208,5,
     169,0,1763
E5   1130 DATA 76,8,199,162,0,56,
     189,51,199,233,48,157,51,199
     ,232,224,2084
D7   1140 DATA 3,208,242,169,0,17
     4,51,199,224,0,240,9,24,105,
     100,176,1924
FB   1150 DATA 36,202,76,216,198,
     174,52,199,224,0,240,9,24,10
     5,10,176,1941
EF   1160 DATA 20,202,76,232,198,
     174,53,199,224,0,240,12,24,1
     05,1,176,1936
0A   1170 DATA 4,202,76,248,198,7
     6,63,198,170,169,20,32,210,2
     55,169,13,2103
F8   1180 DATA 32,210,255,169,128
     ,141,138,2,138,96,173,52,199
     ,141,53,199,2126
1A   1190 DATA 173,51,199,141,52,
     199,169,48,141,51,199,96,0,1
     ,11,12,1543
1F   1200 DATA 0,0,0,0,0,0,0,1,25
     5,0,48,0,0,0,0,0,304
BE   1210 DATA 162,1,160,27,24,32
     ,240,255,160,0,169,32,32,210
     ,255,200,1959
E5   1220 DATA 192,13,208,248,232
     ,224,5,208,233,96,32,19,192,
     173,60,199,2334
17   1230 DATA 208,6,32,156,192,7
     6,107,199,32,101,193,32,159,
     255,32,228,2008
76   1240 DATA 255,240,251,201,15
     7,208,3,76,168,200,201,29,20
     8,3,76,218,2494
D3   1250 DATA 200,201,145,208,3,
     76,22,201,201,17,208,3,76,45
     ,201,201,2008
13   1260 DATA 43,208,3,76,203,20
     1,201,45,208,3,76,231,201,16
     0,0,201,2060
25   1270 DATA 32,240,24,201,160,
     240,20,160,1,201,20,240,14,2
     01,148,240,2142
9D   1280 DATA 10,160,2,201,33,24
     0,4,201,49,208,3,76,84,201,2
     01,64,1737
A6   1290 DATA 208,3,76,219,205,1
     60,3,201,50,240,14,201,34,24
     0,10,160,2024
74   1300 DATA 4,201,51,240,4,201
     ,35,208,3,76,23,202,201,136,
     208,3,1796
4C   1310 DATA 76,80,207,201,81,2
     08,3,76,159,200,201,82,208,3
     ,76,0,1861
80   1320 DATA 192,201,92,208,3,7
     6,227,202,201,169,208,3,76,2
     37,202,201,2498
1E   1330 DATA 42,208,3,76,84,203
     ,201,19,208,3,76,213,204,201
     ,147,208,2096
17   1340 DATA 3,76,234,204,201,6
     5,208,3,76,248,204,201,48,20
     8,3,76,2058
A1   1350 DATA 45,200,201,70,208,
     3,76,247,202,234,76,0,104,32
     ,91,200,1989
4F   1360 DATA 169,0,174,59,199,3
     2,205,189,32,228,255,240,251
     ,201,32,208,2474
98   1370 DATA 6,32,64,199,76,93,
     199,201,43,208,6,238,59,199,
     76,45,1744
12   1380 DATA 200,201,45,208,227
     ,206,59,199,76,45,200,162,2,
     160,27,24,2041
11   1390 DATA 32,240,255,162,0,1
     89,114,200,240,7,32,210,255,
     232,76,101,2345
76   1400 DATA 200,96,32,32,32,32
     ,68,69,76,65,89,17,17,157,15
     7,157,1296
27   1410 DATA 157,157,157,157,15
     7,83,80,65,67,69,32,69,88,73
     ,84,83,1578
7C   1420 DATA 145,157,157,157,15
     7,157,157,157,32,32,32,157,1
     57,157,0,32,1843
94   1430 DATA 68,229,162,0,156,2
     1,208,96,173,62,199,201,0,20
     8,3,76,1862
1C   1440 DATA 70,201,173,60,199,
     201,0,208,15,206,62,199,173,
     0,208,56,2031
46   1450 DATA 233,8,141,0,208,76
     ,70,201,206,62,199,206,62,19
     9,173,0,2044
EF   1460 DATA 208,56,233,16,141,
     0,208,76,70,201,173,60,199,2
     01,0,208,2050
58   1470 DATA 25,173,62,199,201,
     23,208,3,76,70,201,238,62,19
     9,173,0,1913
7C   1480 DATA 208,24,105,8,141,0
     ,208,76,70,201,173,62,199,20
     1,22,208,1906
50   1490 DATA 3,76,70,201,238,62
     ,199,238,62,199,173,0,208,24
     ,105,16,1874
CE   1500 DATA 141,0,208,76,70,20
     1,173,63,199,208,3,76,70,201
     ,206,63,1958
9E   1510 DATA 199,173,1,208,56,2
     33,8,141,1,208,76,70,201,173
     ,63,199,2010
DB   1520 DATA 201,20,208,3,76,70
     ,201,238,63,199,173,1,208,24
     ,105,8,1798
70   1530 DATA 141,1,208,76,70,20
     1,173,61,199,208,3,76,93,199
     ,169,0,1878
61   1540 DATA 141,61,199,96,173,
     60,199,240,3,76,23,202,173,6
     3,199,24,1932
7E   1550 DATA 109,63,199,109,63,
     199,141,51,199,173,62,199,74
     ,74,74,24,1813
E5   1560 DATA 109,51,199,141,51,
     199,173,62,199,41,7,141,52,1
     99,169,7,1800
2A   1570 DATA 56,237,52,199,170,
     169,1,224,0,240,5,10,202,76,
     135,201,1977
46   1580 DATA 141,52,199,192,1,2
     40,17,192,2,240,35,172,51,19
     9,177,251,2161
71   1590 DATA 77,52,199,145,251,
     76,110,205,172,51,199,169,25
     5,56,237,52,2306
39   1600 DATA 199,141,52,199,177
     ,251,45,52,199,145,251,76,19
     0,205,172,51,2405
58   1610 DATA 199,177,251,13,52,
     199,145,251,76,110,205,32,4,
     202,165,151,2232
78   1620 DATA 24,109,55,199,176,
     9,133,151,205,56,199,240,7,1
     44,5,173,1885
30   1630 DATA 57,199,133,151,76,
     49,203,32,4,202,165,151,56,2
     37,55,199,1969
5F   1640 DATA 133,151,144,8,205,
     57,199,144,3,76,1,202,173,56
     ,199,133,1884
D9   1650 DATA 151,76,49,203,174,
     59,199,224,0,240,11,160,240,
     136,192,0,2114
82   1660 DATA 208,251,202,76,7,2
     02,96,173,60,199,208,3,76,93
     ,199,173,2226
6C   1670 DATA 63,199,24,109,63,1
     99,109,63,199,141,51,199,173
     ,62,199,74,1927
02   1680 DATA 74,74,24,109,51,19
     9,141,51,199,173,62,199,41,7
     ,141,52,1597
CE   1690 DATA 199,169,7,56,237,5
     2,199,74,170,169,3,224,0,240
     ,6,10,1815
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06  1700 DATA 10,202,76,75,202,1
    41,52,199,192,1,240,43,192,2
    ,240,61,1928
93  1710 DATA 192,3,240,86,192,4
    ,240,110,172,51,199,177,251,
    45,52,199,2213
28  1720 DATA 240,3,76,135,202,1
    73,52,199,41,170,141,52,199,
    177,251,13,2124
E4  1730 DATA 52,199,145,251,76,
    110,205,169,255,56,237,52,19
    9,141,52,199,2398
85  1740 DATA 172,51,199,177,251
    ,45,52,199,145,251,76,190,20
    5,169,255,56,2493
3E  1750 DATA 237,52,199,172,51,
    199,49,251,170,173,52,199,41
    ,170,141,52,2208
F7  1760 DATA 199,138,13,52,199,
    145,251,76,110,205,173,52,19
    9,73,255,172,2312
7D  1770 DATA 51,199,49,251,170,
    173,52,199,41,85,141,52,199,
    138,13,52,1865
ED  1780 DATA 199,145,251,76,110
    ,205,172,51,199,177,251,13,5
    2,199,145,251,2496
8C  1790 DATA 76,110,205,165,151
    ,24,105,10,133,151,76,49,203
    ,165,151,56,1830
C9  1800 DATA 233,10,133,151,76,
    49,203,162,2,160,27,24,32,24
    0,255,162,1919
A2  1810 DATA 0,189,13,203,240,2
    1,32,210,255,232,76,1,203,70
    ,73,76,1894
A4  1820 DATA 76,17,157,157,86,6
    5,76,85,69,32,0,169,0,32,201
    ,197,1419
FF  1830 DATA 240,9,160,0,145,25
    1,200,192,64,208,249,32,64,1
    99,76,93,2182
4F  1840 DATA 199,173,18,192,201
    ,2,240,20,201,1,240,11,165,1
    51,141,252,2207
70  1850 DATA 7,141,250,7,141,25
    1,7,165,151,141,249,7,165,15
    1,32,108,1973
05  1860 DATA 197,76,93,199,162,
    2,160,27,24,32,240,255,162,0
    ,189,174,1992
52  1870 DATA 204,240,7,32,210,2
    55,232,76,94,203,32,159,255,
    32,228,255,2514
15  1880 DATA 240,248,201,32,240
    ,35,201,133,240,52,201,137,2
    40,64,201,134,2599
07  1890 DATA 240,74,201,138,240
    ,107,201,135,240,24,201,139,
    240,23,201,136,2540
BC  1900 DATA 240,22,201,140,240
    ,21,76,106,203,76,101,204,76
    ,204,203,76,2189
64  1910 DATA 241,203,76,21,204,
    76,42,204,76,61,204,76,82,20
    4,174,44,1988
AD  1920 DATA 199,232,224,16,208
    ,2,162,0,142,44,199,76,107,2
    04,174,44,2033
74  1930 DATA 199,202,16,2,162,1
    5,142,44,199,76,107,204,174,
    60,199,208,2009
D2  1940 DATA 16,174,45,199,232,
    224,16,208,2,162,0,142,45,19
    9,76,107,1847
B3  1950 DATA 204,174,46,199,232
    ,224,16,208,2,162,0,142,46,1
    99,76,107,2037
48  1960 DATA 204,174,60,199,208
    ,14,174,45,199,202,16,2,162,
    15,142,45,1861
10  1970 DATA 199,76,107,204,174
    ,46,199,202,16,2,162,15,142,
    46,199,76,1865
7A  1980 DATA 107,204,76,106,203
    ,173,60,199,240,248,174,47,1
    99,232,224,16,2508
DE  1990 DATA 208,2,162,0,142,47
    ,199,76,107,204,173,60,199,2
    40,227,174,2220
16  2000 DATA 47,199,202,16,2,16
    2,15,142,47,199,76,107,204,1
    73,60,199,1850
93  2010 DATA 240,208,174,48,199
    ,232,224,16,208,2,162,0,142,
    48,199,76,2178
7A  2020 DATA 107,204,173,60,199
    ,240,187,174,48,199,202,16,2
    ,162,15,142,2130
B5  2030 DATA 48,199,76,107,204,
    32,64,199,76,93,199,32,228,2
    55,208,251,2271
C1  2040 DATA 32,19,192,173,60,1
    99,208,21,32,156,192,173,45,
    199,141,40,1882
31  2050 DATA 208,141,41,208,141
    ,42,208,141,43,208,76,106,20
    3,32,101,193,2092
BD  2060 DATA 173,46,199,141,40,
    208,141,41,208,141,42,208,14
    1,43,208,173,2153
49  2070 DATA 47,199,141,37,208,
    173,48,199,141,38,208,76,106
    ,203,67,79,1970
6C  2080 DATA 76,79,85,82,32,67,
    72,65,78,71,69,17,17,157,157
    ,157,1281
38  2090 DATA 157,157,157,157,15
    7,157,157,157,157,83,80,65,6
    7,69,32,69,1878
17  2100 DATA 88,73,84,83,0,169,
    0,141,62,199,141,63,199,169,
    32,141,1644
12  2110 DATA 0,208,169,66,141,1
    ,208,76,93,199,160,0,169,0,1
    45,251,1886
B4  2120 DATA 200,192,64,208,249
    ,76,93,199,162,2,160,27,24,3
    2,240,255,2183
E0  2130 DATA 162,0,189,47,205,2
    40,7,32,210,255,232,76,2,205
    ,32,228,2122
01  2140 DATA 255,208,251,173,58
    ,199,32,210,255,32,228,255,2
    40,251,201,48,2896
9C  2150 DATA 144,247,201,57,176
    ,243,141,58,199,32,64,199,76
    ,93,199,32,2161
F7  2160 DATA 65,85,84,79,32,32,
    32,56,32,49,32,50,17,157,157
    ,157,1116
27  2170 DATA 157,157,157,157,15
    7,157,157,157,157,157,65,68,
    86,65,78,67,1999
A5  2180 DATA 69,32,55,32,144,48
    ,31,32,51,17,157,157,157,157
    ,157,54,1350
40  2190 DATA 32,53,32,52,157,15
    7,157,157,157,157,144,157,15
    7,0,173,58,1800
AF  2200 DATA 199,56,233,48,208,
    3,76,93,199,201,1,208,3,76,2
    2,201,1827
00  2210 DATA 201,3,208,3,76,218
    ,200,201,5,208,3,76,45,201,2
    01,7,1856
0B  2220 DATA 208,3,76,168,200,1
    60,128,140,61,199,201,2,208,
    6,32,22,1814
95  2230 DATA 201,76,218,200,201
    ,4,208,6,32,45,201,76,218,20
    0,201,6,2093
CD  2240 DATA 208,6,32,45,201,76
    ,168,200,32,22,201,76,168,20
    0,173,58,1866
99  2250 DATA 199,56,233,48,240,
    13,170,202,202,202,202,138,2
    40,8,16,3,2172
E6  2260 DATA 24,105,8,76,116,20
    5,169,8,76,116,205,162,2,160
    ,27,24,1483
3B  2270 DATA 32,240,255,162,0,1
    89,74,206,32,210,255,232,201
    ,0,208,245,2541
4B  2280 DATA 32,159,255,32,228,
    255,201,0,240,246,201,32,208
    ,6,32,64,2191
0D  2290 DATA 199,76,107,199,201
    ,157,208,6,32,134,206,76,57,
    206,201,29,2094
65  2300 DATA 208,6,32,175,206,7
    6,57,206,201,145,208,6,32,21
    0,206,76,2050
92  2310 DATA 57,206,201,17,208,
    6,32,0,207,76,57,206,76,240,
    205,162,1956
DB  2320 DATA 1,160,1,202,208,25
    3,136,208,250,173,60,199,208
    ,6,32,156,2253
D1  2330 DATA 192,76,71,206,32,1
    01,193,76,44,206,83,67,82,79
    ,76,76,1660
04  2340 DATA 32,77,79,68,69,157
    ,157,157,157,157,157,157,157
    ,157,157,157,2052
2F  2350 DATA 17,163,163,163,163
    ,163,163,163,163,163,163,163
    ,157,157,157,157,2438
1E  2360 DATA 157,157,157,157,15
    7,157,157,17,60,83,80,65,67,
    69,62,32,1634
9D  2370 DATA 69,88,73,84,83,0,7
    6,48,207,160,0,177,251,48,4,
    24,1392
43  2380 DATA 76,148,206,56,200,
    200,177,251,42,145,251,136,1
    77,251,42,145,2503
4D  2390 DATA 251,136,177,251,42
    ,145,251,200,200,200,192,63,
    208,221,96,76,2709
DA  2400 DATA 64,207,160,2,177,2
    51,106,136,136,177,251,106,1
    45,251,200,177,2546
23  2410 DATA 251,106,145,251,20
    0,177,251,106,145,251,200,20
    0,200,192,65,208,2948
42  2420 DATA 227,96,160,0,177,2
    51,153,51,199,200,192,3,208,
    246,162,2,2327
30  2430 DATA 177,251,136,136,13
    6,145,251,200,200,200,200,23
    2,224,63,208,240,2999
72  2440 DATA 160,60,162,0,189,5
    1,199,145,251,200,232,224,3,
    208,245,96,2425
82  2450 DATA 160,60,162,0,177,2
    51,157,51,199,200,232,224,3,
    208,245,160,2489
B2  2460 DATA 59,162,0,177,251,2
    00,200,200,145,251,136,136,1
    36,136,232,224,2645
C0  2470 DATA 60,208,240,160,0,1
    85,51,199,145,251,200,192,3,
    208,246,96,2444
99  2480 DATA 172,60,199,192,0,2
    08,3,76,137,206,32,137,206,7
    6,137,206,2047
FF  2490 DATA 172,60,199,192,0,2
    08,3,76,178,206,32,178,206,7
    6,178,206,2170
73  2500 DATA 173,60,199,208,84,
    169,255,141,60,199,169,30,14
    1,28,208,173,2297
```

```
2D 2510 DATA 29,208,73,1,141,29
   ,208,173,62,199,106,144,36,2
   06,62,199,1876
D9 2520 DATA 206,0,208,206,0,20
   8,206,0,208,206,0,208,206,0,
   208,206,2276
44 2530 DATA 0,208,206,0,208,20
   6,0,208,206,0,208,206,0,208,
   76,151,2091
41 2540 DATA 207,206,0,208,206,
   0,208,173,46,199,141,40,208,
   141,41,208,2232
80 2550 DATA 141,42,208,141,43,
   208,76,93,199,169,0,141,60,1
   99,141,28,1889
7B 2560 DATA 208,173,29,208,73,
   1,141,29,208,238,0,208,238,0
   ,208,173,2135
D2 2570 DATA 45,199,141,40,208,
   141,41,208,141,42,208,141,43
   ,208,76,93,1975
1D 2580 DATA 199,199,0,0,0,0,0,
   0,0,0,0,0,0,0,0,0,398
BB 2590 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
CC 2600 DATA 96,0,0,0,0,0,0,0,0
   ,0,0,100,0,10,0,0,206
```

PROGRAM: SPRITE LOADER 2

```
A0 10 BL-191   :LN=50    :SA=2662
   4
5B 20 FOR L=0 TO BL:CX-0:FOR D-
   0 TO 15:READ A:CX=CX+A:POKE
   SA+L*16+D,A:NEXT D
A5 30 READ A:IF A><CX THENPRINT
   "ERROR IN LINE";LN+(L*10):ST
   OP
40 40 NEXT L:END
89 50 DATA 201,68,208,3,76,72,1
   04,201,94,208,3,76,250,111,2
   01,95,1971
00 60 DATA 208,3,76,108,112,201
   ,67,208,3,76,7,113,201,75,20
   8,3,1669
74 70 DATA 76,138,113,201,77,20
   8,3,76,193,113,201,80,208,3,
   76,249,2015
32 80 DATA 114,201,140,208,3,76
   ,34,115,201,61,208,3,76,173,
   115,234,1962
BE 90 DATA 76,3,192,0,0,0,0,0,3
   2,68,229,169,0,141,21,208,11
   39
64 100 DATA 162,1,160,13,24,32,
   240,255,169,139,160,104,32,3
   0,171,32,1724
6A 110 DATA 228,255,201,133,240
   ,31,201,135,240,22,201,134,2
   40,15,201,81,2558
B3 120 DATA 208,237,32,68,229,1
   69,31,141,21,208,76,6,192,76
   ,91,111,1896
06 130 DATA 76,45,105,169,31,76
   ,237,105,141,21,208,68,65,84
   ,65,32,1528
A9 140 DATA 83,84,79,82,65,71,6
   9,157,157,157,157,157,157,15
   7,157,157,1946
86 150 DATA 157,157,157,17,163,
   163,163,163,163,163,163,163,
   163,163,163,163,2444
52 160 DATA 17,17,17,13,32,32,3
   2,32,32,32,32,32,32,32,32,5,
   421
F4 170 DATA 81,31,32,81,85,73,8
   4,17,17,13,32,32,32,32,32,32
   ,706
A4 180 DATA 32,32,32,32,5,70,49
   ,31,32,68,73,83,75,32,83,84,
   813
52 190 DATA 79,82,65,71,69,13,1
   7,17,32,32,32,32,32,32,32,32
   ,669
21 200 DATA 32,32,5,70,51,31,32
   ,80,82,73,78,84,45,79,85,84,
   943
C9 210 DATA 13,17,17,32,32,32,3
   2,32,32,32,32,32,32,5,70,53,
   495
B4 220 DATA 31,32,83,67,82,69,6
   9,78,32,68,85,77,80,0,83,80,
   1016
FE 230 DATA 82,73,84,69,32,78,8
   5,77,66,69,82,32,0,32,68,229
   ,1158
32 240 DATA 165,151,141,71,104,
   162,1,160,13,24,32,240,255,1
   69,18,160,1866
67 250 DATA 105,32,30,171,162,3
   ,160,9,24,32,240,255,169,30,
   160,105,1687
CC 260 DATA 32,30,171,165,151,3
   2,15,192,133,151,32,9,192,16
   2,5,142,1614
D6 270 DATA 67,104,162,4,142,68
   ,104,160,0,140,69,104,160,0,
   140,70,1494
6F 280 DATA 104,174,68,104,172,
   67,104,24,32,240,255,172,69,
   104,177,251,2117
D4 290 DATA 170,169,0,32,205,18
   9,172,69,104,200,192,63,240,
   41,140,69,2055
BF 300 DATA 104,238,70,104,174,
   70,104,224,3,240,12,173,67,1
   04,24,105,1816
2B 310 DATA 8,141,67,104,76,113
   ,105,162,0,142,70,104,238,68
   ,104,169,1671
64 320 DATA 5,141,67,104,76,113
   ,105,169,222,160,105,32,30,1
   71,32,228,1760
77 330 DATA 255,240,251,173,71,
   104,133,151,32,9,192,173,120
   ,111,240,3,2258
29 340 DATA 76,127,111,169,31,1
   41,21,208,32,68,229,76,6,192
   ,29,29,1545
FB 350 DATA 80,82,69,83,83,32,6
   5,32,75,69,89,32,0,165,151,1
   41,1248
18 360 DATA 71,104,32,68,229,16
   9,255,160,105,32,30,171,76,2
   08,106,17,1833
9A 370 DATA 32,32,32,32,32,32,3
   2,32,32,32,32,32,32,68,73,83
   ,640
E7 380 DATA 75,32,65,67,67,69,8
   3,83,17,157,157,157,157,157,
   157,157,1657
35 390 DATA 157,157,157,157,163
   ,163,163,163,32,163,163,163,
   163,163,163,13,2303
72 400 DATA 17,17,32,32,32,32,3
   2,32,32,32,5,81,31,85,73,84,
   649
AA 410 DATA 13,17,32,32,32,32,3
   2,32,32,32,5,76,31,79,65,68,
   610
EB 420 DATA 13,32,32,32,32,32,3
   2,32,32,5,83,31,65,86,69,13,
   621
D9 430 DATA 32,32,32,32,32,32,3
   2,32,5,82,31,69,76,79,67,65,
   730
54 440 DATA 84,69,68,32,76,79,6
   5,68,13,17,32,32,32,32,32,32
   ,763
37 450 DATA 32,32,5,68,31,73,82
   ,69,67,84,79,82,89,13,17,32,
   855
F8 460 DATA 32,32,32,32,32,32,3
   2,5,62,31,32,67,79,77,77,65,
   719
50 470 DATA 78,68,13,17,32,32,3
   2,32,32,32,32,32,5,63,31,32,
   563
FA 480 DATA 83,84,65,84,85,83,1
   3,17,32,32,32,32,32,32,32,32
   ,770
19 490 DATA 32,32,32,32,32,32,6
   7,72,79,73,67,69,32,58,45,0,
   754
84 500 DATA 32,228,255,240,251,
   201,81,208,11,173,71,104,133
   ,151,32,9,2180
21 510 DATA 192,76,211,105,201,
   46,240,4,201,47,208,3,24,105
   ,16,32,1711
80 520 DATA 210,255,201,63,208,
   3,76,32,107,201,62,208,3,76,
   24,108,1837
D9 530 DATA 201,68,208,3,76,66,
   108,201,76,208,3,76,69,109,2
   01,83,1756
BD 540 DATA 208,3,76,24,110,201
   ,82,208,3,76,152,110,234,76,
   242,105,1910
B3 550 DATA 169,13,32,210,255,3
   2,210,255,169,0,133,183,169,
   15,133,184,2162
6A 560 DATA 133,185,169,8,133,1
   86,32,193,225,166,184,32,198
   ,255,32,207,2338
EE 570 DATA 255,72,165,144,208,
   7,104,32,210,255,76,62,107,1
   04,165,184,2150
01 580 DATA 133,73,32,204,225,3
   2,198,255,169,13,32,210,255,
   169,222,160,2382
24 590 DATA 105,32,30,171,32,22
   8,255,240,251,32,68,229,76,2
   42,105,13,2109
FF 600 DATA 32,32,32,32,32,32,3
   2,32,32,32,32,68,73,83,75,32
   ,683
BE 610 DATA 67,79,77,77,65,78,6
   8,13,32,32,32,32,32,32,62,16
   4,942
0B 620 DATA 157,0,0,0,0,0,0,0,0
   ,0,0,0,0,0,0,0,157
EB 630 DATA 0,0,0,0,0,0,0,0,0,0
   ,0,0,0,0,0,0,0
A5 640 DATA 0,0,169,136,160,107
   ,32,30,171,160,0,140,68,104,
   32,228,1537
88 650 DATA 255,240,251,172,68,
   104,201,34,240,244,201,20,20
   8,31,192,0,2461
0F 660 DATA 240,233,136,169,157
   ,32,210,255,169,164,32,210,2
   55,169,32,32,2495
8C 670 DATA 210,255,169,157,32,
   210,255,32,210,255,76,187,10
   7,201,13,208,2577
6D 680 DATA 6,169,32,32,210,255
   ,96,201,32,144,192,201,128,1
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   76,188,204,2266
3D 690 DATA 67,104,176,183,153,
   146,107,200,32,210,255,169,1
   64,32,210,255,2463
2A 700 DATA 169,157,32,210,255,
   76,187,107,169,13,32,210,255
   ,169,28,141,2210
16 710 DATA 67,104,32,178,107,1
   69,146,133,187,169,107,133,1
   88,132,183,169,2204
8B 720 DATA 15,133,184,133,185,
   169,8,133,186,32,193,225,32,
   231,255,76,2190
E1 730 DATA 32,107,169,147,32,2
   10,255,169,48,133,252,169,2,
   133,253,169,2280
D7 740 DATA 0,133,144,169,36,13
   3,251,169,251,133,187,169,0,
   133,188,165,2261
C2 750 DATA 253,133,183,169,8,1
   33,186,169,96,133,185,32,213
   ,243,165,186,2487
43 760 DATA 32,180,255,165,185,
   32,150,255,164,144,208,69,16
   0,6,132,251,2388
8A 770 DATA 32,165,255,166,252,
   133,252,164,144,208,54,164,2
   51,136,208,238,2822
C1 780 DATA 164,252,32,205,189,
   169,32,32,210,255,32,165,255
   ,72,165,203,2432
5C 790 DATA 201,60,240,39,104,1
   66,144,208,24,170,240,6,32,2
   10,255,24,2123
CE 800 DATA 144,232,169,13,32,2
   10,255,165,197,201,63,240,4,
   160,4,208,2297
69 810 DATA 189,32,66,246,169,0
   ,133,198,76,32,107,165,203,2
   01,64,208,2089
74 820 DATA 250,165,203,201,60,
   208,250,165,203,201,64,208,2
   50,76,164,108,2776
99 830 DATA 147,32,32,32,32,32,
   32,32,32,32,32,32,32,17,32,3
   2,612
39 840 DATA 32,76,79,65,68,17,1
   57,157,157,157,163,163,163,1
   63,13,13,1643
EE 850 DATA 17,17,17,17,17,17,3
   2,32,32,32,70,73,76,69,78,65
   ,661
43 860 DATA 77,69,0,147,32,32,3
   2,32,32,32,32,32,32,32,32,32
   ,677
3F 870 DATA 17,32,32,32,83,65,8
   6,69,17,157,157,157,157,163,
   163,163,1550
7E 880 DATA 163,13,17,17,17,17,
   17,17,32,32,32,32,70,73,76,6
   9,694
57 890 DATA 78,65,77,69,0,169,2
   24,160,108,32,30,171,169,16,
   141,67,1576
AB 900 DATA 104,32,178,107,192,
   0,208,3,76,242,105,162,8,169
   ,8,160,1754
7D 910 DATA 1,32,186,255,173,68
   ,104,162,146,160,107,32,189,
   255,169,0,2039
03 920 DATA 162,255,160,255,32,
   213,255,142,67,104,140,68,10
   4,76,232,110,2375
B2 930 DATA 13,17,17,32,32,32,3
   2,32,32,83,84,65,82,84,32,83
   ,752
05 940 DATA 80,82,73,84,69,32,4
   0,73,78,67,76,85,83,73,86,69
   ,1150
3C 950 DATA 41,32,62,0,13,17,17
   ,32,32,32,32,32,32,32,69,78,
   553
FB 960 DATA 68,32,32,83,80,82,7
   3,84,69,32,40,73,78,67,76,85
   ,1054
79 970 DATA 83,73,86,69,41,32,6
   2,0,147,32,32,32,32,32,32,32
   ,817
AB 980 DATA 32,32,32,17,82,69,7
   6,79,67,65,84,69,68,32,76,79
   ,959
27 990 DATA 65,68,17,157,157,15
   7,157,157,157,157,157,157,15
   7,157,157,157,2191
4C 1000 DATA 157,163,163,163,16
   3,163,163,163,163,163,163,16
   3,163,163,163,13,2452
8E 1010 DATA 17,17,17,17,17,17,
   32,32,32,32,70,73,76,69,78,6
   5,661
E9 1020 DATA 77,69,0,32,84,79,3
   2,0,169,19,160,109,32,30,171
   ,169,1232
B0 1030 DATA 16,141,67,104,32,1
   78,107,192,0,208,3,76,242,10
   5,140,69,1680
E0 1040 DATA 104,162,8,169,128,
   160,109,32,30,171,169,0,32,1
   5,192,133,1614
C5 1050 DATA 151,240,232,32,9,1
   92,169,164,160,109,32,30,171
   ,169,0,32,1892
4B 1060 DATA 15,192,133,151,166
   ,251,134,167,166,252,134,168
   ,165,151,201,0,2446
51 1070 DATA 240,201,201,255,20
   8,14,169,0,133,251,169,64,13
   3,252,76,121,2487
28 1080 DATA 110,32,9,192,230,1
   51,32,9,192,162,8,169,8,160,
   255,32,1751
7C 1090 DATA 186,255,173,69,104
   ,162,146,160,107,32,189,255,
   166,251,164,252,2671
8C 1100 DATA 169,167,32,216,255
   ,76,32,107,169,200,160,109,3
   2,30,171,169,2094
0E 1110 DATA 16,169,16,141,67,1
   04,32,178,107,192,0,208,3,76
   ,242,105,1656
F4 1120 DATA 169,128,160,109,32
   ,30,171,169,0,32,15,192,133,
   151,32,9,1532
DE 1130 DATA 192,208,3,76,242,1
   05,169,8,162,8,160,0,32,186,
   255,173,1979
C2 1140 DATA 68,104,162,146,160
   ,107,32,189,255,169,0,166,25
   1,164,252,32,2257
05 1150 DATA 213,255,142,67,104
   ,140,68,104,169,19,160,110,3
   2,30,171,174,1958
CD 1160 DATA 67,104,173,68,104,
   32,205,189,76,32,107,147,17,
   32,32,32,1417
36 1170 DATA 32,32,32,32,32,32,
   32,83,80,82,73,84,69,32,68,6
   5,860
4B 1180 DATA 84,65,32,80,82,73,
   78,84,79,85,84,13,32,32,32,3
   2,967
D8 1190 DATA 32,32,32,32,32,32,
   163,163,163,163,163,163,163,
   163,163,163,1822
95 1200 DATA 163,163,163,163,16
   3,163,163,163,163,163,13,17,
   17,17,17,32,1743
5E 1210 DATA 32,32,32,32,32,32,
   32,32,32,32,83,80,82,73,84,6
   9,791
0C 1220 DATA 32,84,73,84,76,69,
   32,45,32,13,0,169,251,160,11
   0,32,1262
BC 1230 DATA 30,171,169,24,141,
   67,104,32,178,107,132,167,19
   2,0,240,9,1763
D9 1240 DATA 169,1,141,120,111,
   76,45,105,0,32,68,229,76,211
   ,105,169,1658
59 1250 DATA 0,141,120,111,169,
   0,32,189,255,169,4,170,160,2
   55,32,186,1993
2D 1260 DATA 255,32,192,255,162
   ,4,32,201,255,169,14,32,210,
   255,160,0,2228
28 1270 DATA 185,146,107,32,210
   ,255,200,196,167,208,245,169
   ,15,32,210,255,2632
18 1280 DATA 169,13,32,210,255,
   162,4,134,168,162,0,134,167,
   160,0,177,1947
22 1290 DATA 167,32,242,111,32,
   210,255,24,165,167,105,1,133
   ,167,165,168,2144
CB 1300 DATA 105,0,133,168,232,
   224,40,208,228,169,13,32,210
   ,255,162,0,2179
B6 1310 DATA 165,168,201,7,208,
   215,165,167,201,200,144,209,
   32,231,255,76,2644
C4 1320 DATA 211,105,201,32,176
   ,3,24,105,64,96,169,0,141,23
   3,112,169,1841
C9 1330 DATA 60,141,234,112,172
   ,233,112,177,251,141,235,112
   ,200,177,251,141,2749
F4 1340 DATA 236,112,200,177,25
   1,141,237,112,172,234,112,17
   7,251,172,233,112,2929
79 1350 DATA 145,251,172,234,11
   2,200,177,251,172,233,112,20
   0,145,251,172,234,3061
62 1360 DATA 112,200,200,177,25
   1,172,233,112,200,200,145,25
   1,172,234,112,173,2944
C1 1370 DATA 235,112,145,251,20
   0,173,236,112,145,251,200,17
   3,237,112,145,251,2978
05 1380 DATA 172,233,112,200,20
   0,200,140,233,112,172,234,11
   2,136,136,136,140,2668
B6 1390 DATA 234,112,173,233,11
   2,201,33,208,155,76,3,192,16
   9,0,141,233,2275
84 1400 DATA 112,160,0,165,251,
   141,237,112,165,252,141,238,
   112,177,251,32,2546
22 1410 DATA 212,112,141,234,11
   2,200,177,251,32,212,112,141
   ,235,112,200,177,2660
FE 1420 DATA 251,32,212,112,141
   ,236,112,160,0,173,236,112,1
   45,251,200,173,2546
B5 1430 DATA 235,112,145,251,20
   0,173,234,112,145,251,174,23
   3,112,232,142,233,2984
18 1440 DATA 112,224,21,240,18,
   24,165,251,105,3,133,251,165
   ,252,105,0,2069
C1 1450 DATA 133,252,160,0,76,1
   25,112,173,237,112,133,251,1
   73,238,112,133,2420
CB 1460 DATA 252,76,3,192,141,6
   7,104,162,0,24,110,67,104,46
   ,68,104,1520
C8 1470 DATA 232,224,8,208,244,
   173,68,104,96,0,0,0,0,0,0,84
   ,1441
DB 1480 DATA 65,82,71,69,84,160
   ,0,83,79,85,82,67,69,160,32,
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    32,1220
3D  1490 DATA 32,32,157,157,157,
    157,0,162,3,160,27,24,32,240
    ,255,169,1764
DA  1500 DATA 239,160,112,32,30,
    171,165,151,141,67,104,32,15
    ,192,240,92,1943
46  1510 DATA 133,151,141,71,104
    ,32,9,192,165,251,133,167,16
    5,252,133,168,2267
16  1520 DATA 162,3,160,27,24,32
    ,240,255,169,247,160,112,32,
    30,171,169,1993
71  1530 DATA 0,32,15,192,240,54
    ,133,151,32,9,192,160,0,177,
    251,145,1783
D9  1540 DATA 167,200,192,63,208
    ,247,173,18,192,201,1,240,16
    ,201,2,240,2361
28  1550 DATA 21,173,71,104,141,
    252,7,141,250,7,141,251,7,17
    3,71,104,1914
19  1560 DATA 141,249,7,76,127,1
    13,173,71,104,76,127,113,173
    ,67,104,133,1854
30  1570 DATA 151,32,9,192,32,12
    ,192,76,6,192,238,18,192,173
    ,18,192,1725
EF  1580 DATA 201,3,208,9,206,18
    ,192,206,18,192,206,18,192,7
    6,3,192,1940
E1  1590 DATA 77,85,76,84,73,32,
    83,80,82,73,84,69,17,17,157,
    157,1246
89  1600 DATA 157,157,157,157,15
    7,157,157,157,80,82,69,83,69
    ,78,84,32,1833
4F  1610 DATA 0,169,4,141,67,104
    ,162,2,160,27,24,32,240,255,
    169,160,1716
FF  1620 DATA 160,113,32,30,171,
    169,0,174,67,104,32,205,189,
    120,32,159,1757
4E  1630 DATA 255,32,228,255,240
    ,248,201,32,208,7,32,12,192,
    88,76,6,2112
95  1640 DATA 192,201,49,144,13,
    201,56,176,9,56,233,48,141,6
    7,104,76,1766
A5  1650 DATA 198,113,201,145,20
    8,12,173,67,104,10,170,232,2
    22,0,208,76,2139
8E  1660 DATA 198,113,201,17,208
    ,12,173,67,104,10,170,232,25
    4,0,208,76,2043
1F  1670 DATA 198,113,201,157,20
    8,31,173,67,104,10,170,189,0
    ,208,56,233,2118
CE  1680 DATA 1,157,0,208,176,12
    ,173,67,104,32,165,114,77,16
    ,208,141,1651
7E  1690 DATA 16,208,76,198,113,
    201,29,208,22,173,67,104,10,
    170,189,0,1784
CB  1700 DATA 208,24,105,1,157,0
    ,208,144,3,76,54,114,76,198,
    113,201,1682
16  1710 DATA 43,208,9,174,67,10
    4,254,248,7,76,118,114,201,4
    5,208,22,1898
D6  1720 DATA 174,67,104,222,248
    ,7,162,0,165,151,32,9,192,32
    ,9,192,1766
E1  1730 DATA 232,208,245,76,198
    ,113,201,137,208,24,169,255,
    141,21,208,169,2605
C7  1740 DATA 254,141,16,208,169
    ,50,141,11,208,141,13,208,14
    1,15,208,76,2000
EC  1750 DATA 198,113,76,175,114
    ,172,67,104,169,1,10,136,208
    ,252,96,201,2092
3C  1760 DATA 94,208,12,32,165,1
    14,77,23,208,141,23,208,76,1
    18,114,201,1814
81  1770 DATA 95,208,12,32,165,1
    14,77,29,208,141,29,208,76,1
    18,114,201,1827
9A  1780 DATA 136,208,12,32,165,
    114,77,28,208,141,28,208,76,
    118,114,201,1866
0D  1790 DATA 44,208,9,174,67,10
    4,222,39,208,76,118,114,201,
    46,208,6,1844
7A  1800 DATA 174,67,104,254,39,
    208,76,198,113,165,251,133,1
    67,165,252,133,2499
5E  1810 DATA 168,165,151,201,25
    5,240,24,230,151,32,9,192,16
    0,0,177,167,2322
66  1820 DATA 145,251,200,192,63
    ,208,247,165,151,141,71,104,
    76,86,113,76,2289
58  1830 DATA 3,192,169,0,32,189
    ,255,169,4,170,160,255,32,18
    6,255,32,2103
0B  1840 DATA 192,255,162,4,32,2
    01,255,169,22,133,167,169,4,
    133,168,160,2226
96  1850 DATA 0,177,167,32,242,1
    11,32,210,255,200,192,17,208
    ,243,169,13,2268
70  1860 DATA 32,210,255,169,40,
    133,167,160,0,162,0,169,15,3
    2,210,255,2009
5B  1870 DATA 177,167,201,160,20
    8,15,169,18,32,210,255,169,3
    2,32,210,255,2310
4B  1880 DATA 169,146,76,129,115
    ,201,76,208,5,169,108,76,129
    ,115,32,242,1996
19  1890 DATA 111,32,210,255,200
    ,192,26,208,215,160,0,169,8,
    32,210,255,2283
85  1900 DATA 169,10,32,210,255,
    165,167,24,105,40,133,167,16
    5,168,105,0,1915
3C  1910 DATA 133,168,232,224,23
    ,208,180,32,231,255,76,3,192
    ,160,0,140,2257
81  1920 DATA 68,104,177,251,141
    ,67,104,162,4,173,67,104,41,
    192,201,128,1984
61  1930 DATA 240,34,201,64,240,
    30,46,67,104,46,68,104,46,67
    ,104,46,1507
CA  1940 DATA 68,104,202,208,228
    ,162,4,173,68,104,145,251,20
    0,192,63,208,2380
F7  1950 DATA 209,76,6,192,173,6
    7,104,73,192,141,67,104,76,1
    98,115,0,1793
3C  1960 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0
```

PROGRAM: EDITOR SAVE

```
65  10 REM **********************
    ***********
94  20 REM * THIS ROUTINE WILL S
    AVE OUT   *
B6  30 REM * THE TWO SECTIONS OF
     THE      *
35  40 REM * SPRITE EDITOR ONTO
    DISK OR   *
4D  50 REM * TAPE. IF USING TAPE
     MAKE SURE*
6F  60 REM * THAT YOU PLACE A NE
    W CASSETTE*
9D  70 REM * IN THE DRIVE WHEN Y
    OU RUN    *
F5  80 REM * THIS PROGRAM.
              *
B5  90 REM **********************
    ***********
0C  100 PRINT"[CLR,DOWN4,SPC4]CR
    EATE [RVSON]T[RVSOFF]APE OR
    [RVSON]D[RVSOFF]ISK VERSION
    (T/D)"
FD  110 GETK$:IFK$<>"T"ANDK$<>"D
    "THEN110
14  120 IFK$-"D"THENDE=8:GOTO 16
    0
AE  130 DE-1:POKE27996,1:POKE283
    61,1:POKE28282,1:POKE28286,0
DA  140 POKE28310,242:POKE28311,
    105:POKE28030,242:POKE28031,
    105
6E  150 POKE 28409,242:POKE28410
    ,105
C9  160 SA-49152:EA=53248:FI$-"S
    PRITE ED PT1":GOSUB 300
63  170 SA-26624:EA-29696:FI$="S
    PRITE ED PT2":GOSUB 300
6A  180 PRINT"[CLR,DOWN2]TO USE
    SPRITE EDITOR IN FUTURE LOAD
     WITH"
9D  190 Q$=CHR$(34):PRINT"LOAD"Q
    $"SPRITE ED PT1"Q$","DE",1":
    PRINT"NEW"
84  200 A$=CHR$(34):PRINT"LOAD"Q
    $"SPRITE ED PT2"Q$","DE",1":
    PRINT"NEW"
37  210 PRINT"THEN START IT WITH
     :"
77  220 PRINT"SYS 49152"
90  230 PRINT"[DOWN2]NOTE WHEN U
    SING CASSETTE IT IS"
4B  240 PRINT"POSSIBLE FOR THE P
    OINTER TO BECOME"
13  250 PRINT"CORRUPTED AFTER A
    TAPE OPERATION."
F7  260 PRINT"IF THIS HAPPENS TH
    EN EXIT PROGRAM"
17  270 PRINT"WITH 'Q' COMMAND A
    ND THEN RESTART"
D2  280 PRINT"WITH SYS 49152"
B3  290 STOP
CF  300 REM * MACHINE CODE SAVE
    ROUTINE *
D5  310 REM SA  = START ADDRESS
44  320 REM EA  - END ADDRESS
98  330 REM DE  = DEVICE FOR SAV
    E
B5  340 REM FI$ = FILE NAME
4B  350 POKE194,SA/256:POKE193,S
    A-PEEK(194)*256
88  360 POKE175,EA/256:POKE174,E
    A-PEEK(175)*256
6A  370 L-LEN(FI$)
ED  380 FORI-1TOL:POKE1023+I,ASC
    (MID$(FI$,I,1)):NEXT
96  390 POKE 187,0:POKE188,4:POK
    E183,L:POKE186,DE:SYS 62954
1F  400 RETURN
```

Cedit 64

A powerful character editor for C64 owners.

By Brian Rhodes

The C64 computer may have the ability to use characters that you design yourself, however, when you actually come to trying to design your own characters you will no doubt find it a bit of a chore. CEDIT 64 is a powerful character editor that takes all of the hard work out of designing and storing your own character sets.

Getting It In

The program is presented in three sections. Type each program in separately and store them on tape or disk. The program CHAR ED M/C LOAD generates a new program and saves this onto tape or disk. If using cassette then this new program should be stored on the cassette after the CHARBAS program. The actual order of the programs on casette should be:
CHAR ED LOADER.
CHAR CODE (created by CHAR ED M/C LOAD).
CHAR BASIC.

If you are using cassette then do make sure that you make the changes as indicated with the listings.

CRSR Keys:	Move cursor
SPACE:	Plot/unplot
1:	Plot sprite colour
2:	Plot m/c # 0 in m/c mode only
3:	Plot m/c # 1 in m/c mode only
DEL:	UnPlots in m/c mode
+:	Next character
-	Previous character
BACK ARROW:	Progress (copy & advance)
A:	Auto advance
W:	Wrapround screen
f1:	Jump to character number
f5:	Change grid between m/c and normal mode
M:	Change display between m/c and normal modes
f7:	Change between defined characters and standard commodore characters. Blue border-CBM character set. Grey border-Defined character set
R:	Restart.
Q:	Quit.
H:	Horizontal axis swap. (Flip)
V:	Vertical axis swap (mirror)
I:	Inverse
UP ARROW:	Scroll mode.
'	Fill to left of cursor.
.	Fill to right of cursor.
CLR:	Erase character
HOME:	Home cursor.
S:	Swap.
F:	Fill.
C:	Copy.
T:	Change test lines
*	Change colours
@	Status
D:	Data store
B:	Block manipulate.
P:	Preset characters for Scratch-Pad.
f2:	Enter Scratch-pad mode. This enables the user to create screens built up out of UDGs. In this mode the cursor is controlled by the cursor keys and when any key is pressed then its character will appear at the cursor position. The exception to this are the number keys which have preset characters assigned to them. Other keys have functions assigned to them.
f1:	Takes a snapshot of the screen and stores it in memory
f2:	Exits the scratch-pad and goes to the main editing screen. Any alterations made to the screen since it was last stored will be lost.
f3:	Stores the screen then exits to the editor.
f4:	Allows the user to change the preset characters and is equivalent to pressing 'P' in edit mode.
f5:	Changes between m/c and normal character printing. The cursor will change colour to indicate m/c mode.
f6:	Recalls the last screen that was stored.
f7:	Changes between CBM character set and the user defined one.
RET:	Changes to reverse printing.
HOM:	Moves the cursor to the top left of the screen.
CLR:	Clears the screen.

PROGRAM: CHAR ED LOADER

```
EC  10 REM CHARACTER EDITOR LOAD
    ER
B2  20 Q$=CHR$(34)
8E  30 POKE53281,6:POKE53280,14
56  40 PRINT"[CLR,BLUE]POKE43,1:
    POKE44,65:POKE16640,0:NEW"
68  50 PRINT"[DOWN2]L[SO]"Q$"CHA
    R CODE"Q$",8,1"
FB  60 PRINT"[DOWN4]NEW"
62  70 PRINT"[DOWN2]L[SO]"Q$"CHA
    R BASIC"Q$",8"
69  80 PRINT"[DOWN4]RUN:[SPC3,WH
    ITE]LOADING : CHARACTER EDIT
    OR"
55  90 PRINT"[DOWN2,SPC12]WRITTE
    N BY BRI[BLUE]"
AF  100 POKE198,6
84  110 POKE631,19:FORK=632TO637
    :POKEK,13:NEXT
F8  120 END
```

PROGRAM: CHAR BAS

```
62  1 REM OPEN15,8,15,"S:Q"
63  2 REM PRINT#15,"R:Q=BASIC":C
    LOSE15
45  3 REM SAVE "BASIC",8
33  9 :
48  10 PRINT"[CLR]"
BC  11 GOSUB60000
41  20 PRINT"[DOWN4,SPC3]CHARACT
    ERS IN PLACE ?";:GOSUB9000
89  25 IFA$="Y"THEN40
1C  30 SYS49488 : REM TRANSFER C
    HARS
EF  35 GOTO50
E6  40 PRINT"[DOWN] REDEFINE GRI
    D CHARACTERS?";:GOSUB9000
50  45 IFA$="N"THEN55
B2  50 SYS49536:SYS49627 : REM P
    RESET CHARS
CB  55 POKE53272,(PEEK(53272)AND
    240)OR2
40  60 POKE53280,12
6D  65 A$=STR$(CH):PRINT"[DOWN]
     START CHARACTER  ";:GOSUB91
    00:CH=A
5B  97 :
58  98 :
8B  99 A=FRE(0):OC=-1:GOTO9200
41  100 IFMG=1THEN2000
E3  110 POKE49991,C(0):A=CH*8+20
    48:HI=INT(A/256):LO=A-HI*256
    :POKE251,LO:POKE252,HI
F0  120 SYS49946:IFCH=OCTHEN140
BF  130 PRINT"[BLUE,HOME,DOWN,SP
    C3]CHARACTER NO.[SPC3,LEFT3]
    ";CH;" ="
4E  135 POKE1087,CH:POKE1090,CH:
    POKE55362,C(4):OC=CH
7C  140 POKE55359,C(0)
F7  150 PE=PEEK(SS-(40*YY)+XX):P
    OKE198,0
E0  155 POKE253,XX:POKE254,YY
60  160 SYS50044:A=0
1A  165 A=A+1:GETA$:IFA$=""ANDA<
    20THEN165
2E  170 IFA=20THEN160
C2  175 POKE(SS-(40*YY)+XX),PE
89  179 :
90  180 IFA$="[UP]"THENYY=YY+1:G
    OTO200
78  185 IFA$="[DOWN]"THENYY=YY-1
    :GOTO200
AE  190 IFA$="[LEFT]"THENXX=XX-1
    :GOTO205
E9  194 IFA$="[RIGHT]"THENXX=XX+
    1:GOTO205
D0  195 IFA$=" "ORA$="[SSPC]"THE
    N250
B1  196 IFA$="+"ANDCH<>255THENCH
    =CH+1:GOTO100
6D  197 IFA$="-"ANDCH<>0THENCH=C
    H-1:GOTO100
D2  198 A=FRE(0):GOTO300
FD  199 :
59  200 IFYY<>-1ANDYY<>8THEN150
73  201 GOTO210
58  205 IFXX<>-1ANDXX<>8THEN150
E5  210 IFWRANDA$<>" "ANDA$<>"[S
    SPC]"THEN220
E9  211 :
89  215 IFXX=8THENXX=7:GOTO150
9B  216 IFXX=-1THENXX=0:GOTO150
9F  217 IFYY=8THENYY=7:GOTO150
9B  218 IFYY=-1THENYY=0:GOTO150
E6  220 :
23  230 IFXX=8THENXX=0:GOTO150
5D  231 IFXX=-1THENXX=7:GOTO150
8D  232 IFYY=8THENYY=0:GOTO150
45  233 IFYY=-1THENYY=7:GOTO150
C3  249 :
87  250 Y=7-YY:X=7-XX:X=2[UPARRO
    W]X
72  255 P=(CH*8+2048+Y):A=PEEK(P
    )
96  260 IFAANDXTHEN270
D0  265 POKEP,(AORX):GOTO275
42  270 POKEP,(AAND255-X)
5C  275 IFAD=0THEN100
96  280 XX=XX+1:IFXX<8THEN100
C7  285 IFWRTHENXX=0:GOTO100
7A  290 XX=7:GOTO100
11  298 :
16  299 :
99  300 I=0:FORA=1TOCO:IFA$=CO$(
    A)THENI=A:A=CO
27  302 NEXT:IFI>0THEN310
6F  305 IFMGTHEN2050
08  308 GOTO150
28  310 ONIGOTO400,355,360,365,3
    70,370,370
83  311 REM      D   A   W   Q
    H   V   I
83  315 ON(I-7)GOTO376,378,5000,
    6000,550
A1  316 REM            R  F1   P
     F2  CLS
39  317 ON(I-12)GOTO560,570,580,
    590,620,650
8F  318 REM            HOM  ,   .
     C   F   B
C0  319 ON(I-18)GOTO1000,1050,11
    50,1300
B7  320 REM             S     T
    M    [LARROW]
63  321 ON(I-22)GOTO1200,2600,30
    00,3300
6B  322 REM             F5    *
    @    [UPARROW]
37  347 GOTO99
64  349 :
4E  350 PRINT"[HOME,DOWN2]";:FOR
    A=0TO13:PRINT"[RIGHT13,SPC26
    ]":NEXT
E8  351 PRINT"[HOME]":GOTO100
59  354 :
CD  355 IFAD=0THENAD=1:PRINTPR$"
    [DOWN6]ADVANCE ON":GOTO357
C8  356 AD=0:PRINTPR$"[DOWN6]ADV
    ANCE OFF"
48  357 FORA=0TO100:GETA$:IFA$<>
    ""THENA=100
2C  358 NEXT:GOTO350
52  359 :
82  360 IFWR=0THENWR=1:PRINTPR$"
    [DOWN6]WRAP ROUND ON":GOTO35
    7
A7  361 WR=0:PRINTPR$"[DOWN6]WRA
    P ROUND OFF"
57  362 GOTO357
56  363 :
D3  365 POKE53272,21:POKE53280,1
    4:POKE53281,6:POKE53270,200:
    PRINT"[C7,CLR]":END
48  369 :
25  370 A=CH*8+2048:POKE252,INT(
    A/256):POKE251,A-(256*PEEK(2
    52))
44  371 IFA$="H"THENSYS49680
3E  372 IFA$="V"THENSYS49719
D2  373 IFA$="I"THENSYS49793
4F  374 GOTO100
42  375 :
13  376 PRINT"[CLR]":RUN
40  377 :
6A  378 PRINT"[CLR]":GOTO60
46  379 :
AA  399 :
D3  400 PRINT"[CLR,BLUE,SPC14]DA
    TA STORAGE"
84  402 PRINT"[SPC14,CT12,DOWN2]
    "
E5  404 PRINT"[SPC7,RED]F1[BLUE,
    SPC5]DISK"
1E  406 PRINT"[SPC7,RED]F3[BLUE,
    SPC5]SCREEN"
3D  408 REM ?"[SPC7,RED]F5[BLUE,
    SPC5]PRINTER"
EB  410 PRINT"[SPC8,RED]Q[BLUE,S
    PC5]QUIT"
9F  412 GETQ$:IFQ$=""THEN412
D7  414 IFQ$="Q"THEN99
9B  416 IFQ$="[F1]"THEN442
0A  418 IFQ$="[F3]"THEN424
34  420 REM IFQ$="[F5]"THEN900
82  422 GOTO400
92  423 :
A0  424 A$="":PRINT"[DOWN]  CHAR
    ACTER NUMBER  ";:GOSUB9100:C
    N=A
0F  426 IFCN<0ORCN>255THEN400
FA  428 PRINT"[CLR,SPC10]CHARACT
    ER DATA[DOWN6]"
BA  430 FORI=0TO7:PRINT"[SPC11]"
    ;PEEK(CN*8+2048+I):NEXTI
50  432 PRINT"[DOWN]  PRESS [RED
    ]Q[BLUE] QUIT, [RED]<SPACE>[
    BLUE] TO REPEAT"
29  434 GETQ$:IFQ$=""THEN434
D9  436 IFQ$="Q"THEN99
BC  438 IFQ$=" "THEN424
8B  440 GOTO434
80  441 :
FA  442 OPEN2,8,15
F9  444 PRINT"[CLR,SPC11]DISK ST
    ORAGE"
D7  446 PRINT"[SPC11,CT4] [CT7]"
A8  448 PRINTTAB(15)"[RED]Q[BLUE
    ]UIT"
69  450 PRINTTAB(15)"[DOWN,RED]R
    [BLUE]ELOCATED LOAD"
F5  452 PRINTTAB(15)"[RED]L[BLUE
    ]OAD"
B0  454 PRINTTAB(15)"[RED]S[BLUE
    ]AVE"
85  456 PRINTTAB(15)"[DOWN,RED]D
    [BLUE]IRECTORY"
12  458 PRINTTAB(15)"[DOWN,RED]>
    [BLUE] DISK COMMAND"
7B  460 PRINTTAB(15)"[RED]?[BLUE
    ] DISK STATUS"
13  462 PRINT"  [RED,DOWN]WARNIN
    G.[BLUE]  WHEN IN DIRECTORY
    MODE"
17  464 PRINT"  DON'T USE <RUN/S
    TOP> TO QUIT![DOWN]"
D3  466 PRINT"  USE <SPACE> TO P
    AUSE.<SPACE>RESTARTS[SPC3]AN
```

```
   Y OTHER KEY QUITS"
15 468 PRINTTAB(12)"CHOICE ? -
   ";
55 470 GETQ$:IFQ$=""THEN470
48 472 IFQ$="/"ORQ$="."THENQ$=C
   HR$(ASC(Q$)+16)
F2 474 PRINTQ$;
B3 476 IFQ$="Q"ORQ$="D"ORQ$="L"
   ORQ$="S"ORQ$="?"ORQ$=">"ORQ$
   ="R"THEN480
2C 478 PRINT"[LEFT] ";:GOTO470
DA 479 :
52 480 IFQ$="D"THENSYS49217:GOT
   0545
BA 482 IFQ$="Q"THENCLOSE2:GOTO9
   9
DE 483 :
5E 484 IFQ$<>">"THEN503
8B 486 PRINT:PRINT"[SPC8]DISK C
   OMMAND":C$="":PRINT"[SPC4]>[
   C@,LEFT]";
C0 488 GETQ$:IFQ$=""THEN488
88 490 IFQ$=CHR$(20)ANDLEN(C$)>
   =1THENC$=LEFT$(C$,LEN(C$)-1)
   :PRINT"[LEFT,C@] [LEFT2]";:G
   OTO488
CF 492 IFQ$=CHR$(13)THENPRINT"
   ":GOTO498
59 494 IFLEN(C$)<40ANDQ$>CHR$(3
   1)ANDQ$<CHR$(127)THENC$=C$+Q
   $:PRINTQ$;"[C@,LEFT]";
CC 496 GOTO488
FD 498 PRINT#2,C$:PRINT"[DOWN,S
   PC8]";
7B 500 GET#2,C$:PRINTC$;:IFC$<>
   CHR$(13)THEN500
B5 501 GOTO545
CD 502 :
A5 503 IFQ$="?"THENPRINT:PRINT"
   [SPC8]";:GOTO500
9C 504 C$="":IFQ$="S"THENPRINT"
   [CLR,SPC13]SAVE":GOTO510
E0 506 IFQ$="R"THENPRINT"[CLR,S
   PC8]RELOCATED LOAD":GOTO510
EF 508 PRINT"[CLR,SPC13]LOAD"
2B 510 PRINT"[DOWN4,SPC3]INPUT
   FILENAME[SPC3,C@,LEFT]";
DB 512 GETX$:IFX$=""THEN512
0F 513 A=ASC(X$)
ED 514 IFA=20ANDLEN(C$)>=1THENC
   $=LEFT$(C$,LEN(C$)-1):PRINT"
   [LEFT,C@] [LEFT2]";:GOTO512
90 516 IFA=13THEN522
7B 517 IFA=34THEN512
1F 518 IFLEN(C$)<16ANDX$>CHR$(3
   1)ANDX$<CHR$(127)THENC$=C$+X
   $:PRINTX$;"[C@,LEFT]";
BB 520 GOTO512
08 522 PRINT" ":IFLEN(C$)=0THEN
   444
A4 524 POKE170,LEN(C$):FORX=1TO
   LEN(C$):POKEX+49151,ASC(MID$
   (C$,X,1)):NEXT
D1 525 IFQ$="R"THENSYS49453:GOT
   0540
12 526 IFQ$="L"THENSYS49181:GOT
   0540
C0 528 IFQ$<>"S"THEN444
6D 530 POKE251,00:POKE252,8
B8 532 SYS49168
E7 540 PRINT"[DOWN,SPC6]";:GOTO
   500
77 545 PRINT:PRINT"[SPC9]PRESS
   A KEY";
40 546 GETA$:IFA$=""THEN546
0A 549 GOTO444
C9 550 X=(CH*8)+2048:FORK=XTOX+
   7:POKEK,0:NEXT:GOTO100
80 560 XX=0:YY=0:GOTO100
C8 570 Y=7-YY:P=(CH*8+2048+Y)
BA 572 FORQ=0TOXX:X=2[UPARROW](
   7-Q):A=PEEK(P):IFAANDXTHEN57
   6
76 574 POKEP,(AORX):GOTO578
83 576 POKEP,(AAND255-X)
BA 578 NEXT:GOTO100
7F 579 :
6E 580 Y=7-YY:P=(CH*8+2048+Y)
F5 582 FORQ=XXTO7:X=2[UPARROW](
   7-Q):A=PEEK(P):IFAANDXTHEN57
   6
34 583 :GOTO574
75 589 :
18 590 PRINTPR$"[DOWN6] COPY CH
   AR"
26 595 PRINTPR$"[DOWN9] SOURCE
   ";:A$="":GOSUB9100:SC=A
1F 600 PRINTPR$"[DOWN9] TARGET
   ";:A$="":GOSUB9100:TC=A:GOSU
   B712
54 605 PRINTPR$"[DOWN9] COPYING
   "
D6 610 FORA=0TO7:POKE(TC*8+2048
   +A),PEEK(SC*8+2048+A):NEXT:G
   OTO350
57 619 :
B8 620 PRINTPR$"[DOWN6] FILL CH
   AR"
81 625 PRINTPR$"[DOWN9] FILL VA
   LUE ";:A$="":GOSUB9100:SC=A
CE 630 PRINTPR$"[DOWN11] CHARAC
   TER NO ";:A$="":GOSUB9100:TC
   =A:GOSUB712
DD 635 PRINTPR$"[DOWN8] FILLING
   "
38 640 FORA=0TO7:POKE(TC*8+2048
   +A),SC:NEXT:GOTO350
B1 649 :
13 650 GOSUB712:GOSUB651:GOTO66
   0
AF 651 PRINTPR$"[LEFT3,DOWN3,BL
   UE] BLOCK MANIPULATION"
04 655 PRINTPR$"[LEFT3,DOWN4] [
   SE5] [SE12]"
AF 659 :
93 660 PRINTPR$"[LEFT3,DOWN5,RE
   D]Q[BLUE]UIT"
EA 661 PRINTPR$"[LEFT3,DOWN6,RE
   D]C[BLUE]OPY BLOCK"
60 665 PRINTPR$"[LEFT3,DOWN7,RE
   D]E[BLUE]RASE BLOCK"
6E 670 PRINTPR$"[LEFT3,DOWN8,RE
   D]S[BLUE]WAP BLOCKS"
05 675 PRINTPR$"[LEFT3,DOWN9,RE
   D]F[BLUE]ILL BLOCK"
A5 700 PRINTPR$"[LEFT3,DOWN12]
   CHOICE -";
FE 705 GETA$:IFA$=""THEN705
9C 710 C$=A$:PRINTA$:IFA$<>"Q"A
   NDA$<>"C"ANDA$<>"E"ANDA$<>"S
   "ANDA$<>"F"THEN650
1C 711 GOSUB712:GOTO715
8F 712 PRINT"[HOME,DOWN]":FORA=
   1TO12:PRINT"[RIGHT13,SPC26]"
   :NEXT
45 713 RETURN
F6 714 :
E5 715 IFC$="Q"THEN350
39 717 PRINTPR$"[DOWN3]ALL INPU
   TS INCLUSIVE"
EB 719 :
7A 720 IFC$<>"C"THEN770
BB 721 PRINTPR$"[DOWN5]  BLOCK
   COPY"
51 725 PRINTPR$"[DOWN7] SOURCE
   START ";:A$="":GOSUB9100:OS=
   A:IFA>255THEN650
9D 730 PRINTPR$"[DOWN9] SOURCE
    END  ";:A$="":GOSUB9100:OE=
   A:IFA>255THEN650
6E 735 PRINTPR$"[DOWN11] TARGET
    START ";:A$="":GOSUB9100:PS
   =A:GOSUB712
90 736 IF(PS>255)OR(OE<OS)THEN6
   50
6A 737 IF((PS>OS)AND(PS<OE))THE
   N650
90 740 PRINTPR$"[DOWN3]  BLOCK
   COPY"
86 745 PRINTPR$"[DOWN5,LEFT5]
   COPY BETWEEN"OS"AND"OE
54 750 PRINTPR$"[DOWN6,LEFT5]
   TO "PS
8E 755 PRINTPR$"[DOWN8] CORRECT
    ?";:GOSUB9000:IFA$="N"THEN7
   11
E1 756 PRINTPR$"[DOWN9] COPYING
   "
FA 760 OS=(OS*8+2048):OE=((OE+1
   )*8+2047):PS=(PS*8+2048)
0D 765 FORA=0TOOE-OS:POKEPS+A,P
   EEK(OS+A):NEXT:GOTO650
3E 769 :
F2 770 IFC$<>"E"ANDC$<>"F"THEN8
   30
E0 771 Q$="[DOWN5]  BLOCK ERASE
   ":IFC$="F"THENQ$="[DOWN5]  B
   LOCK FILL"
08 772 PRINTPR$;Q$
74 775 PRINTPR$"[DOWN7] SOURCE
   START ";:A$="":GOSUB9100:OS=
   A:IFA>255THEN650
16 780 PRINTPR$"[DOWN9] SOURCE
    END  ";:A$="":GOSUB9100:OE=
   A:IFA>255THEN650
66 781 IFOS>OETHEN650
EC 782 IFC$="F"THEN800
28 783 :
15 785 GOSUB712:PRINTPR$;Q$:FI=
   0
4D 790 PRINTPR$"[DOWN7,LEFT5] E
   RASE BETWEEN"OS"AND"OE
79 795 PRINTPR$"[DOWN8] CORRECT
    ?";:GOSUB9000:IFA$="N"THEN7
   11
09 796 FORA=(OS*8+2048)TO((OE+1
   )*8+2047):POKEA,FI:NEXT:GOTO
   650
18 799 :
E3 800 PRINTPR$"[DOWN11] FILL V
   ALUE ";:A$="":GOSUB9100:FI=A
   :IFFI>255THEN650
F2 805 GOSUB712:PRINTPR$;Q$
E4 810 PRINTPR$"[DOWN7,LEFT5] F
   ILL BETWEEN"OS"AND"OE
DB 811 PRINTPR$"[DOWN8,LEFT5] W
   ITH "FI
AF 815 PRINTPR$"[DOWN10] CORREC
   T ?";:GOSUB9000:IFA$="N"THEN
   711
02 820 GOTO796
06 825 :
EA 830 IFC$<>"S"THEN650
87 835 PRINTPR$"[DOWN5]  SWAP B
   LOCKS"
2E 840 PRINTPR$"[DOWN7] BLOCK 1
    START ";:A$="":GOSUB9100:S1
   =A:IFA>255THEN650
52 845 PRINTPR$"[DOWN9] BLOCK 1
    END  ";:A$="":GOSUB9100:E1
   =A:IFA>255THEN650
94 850 PRINTPR$"[DOWN11] BLOCK
   2 START ";:A$="":GOSUB9100:S
   2=A:IFA>255THEN650
0E 855 E2=S2+(E1-S1)
34 860 IF(S1>E1)OR(S2>E2)THEN71
   1
4C 861 IF(E2>S1)AND(E2<E1)THEN7
   11
69 862 IF(S2>S1)AND(S2<E1)THEN7
   11
C6 865 GOSUB712:PRINTPR$"[DOWN6
   ]  SWAP"S1"TO"E1"
D3 866 PRINTPR$"[DOWN8]  WITH"S
   2"TO"E2"
E2 870 PRINTPR$"[DOWN10] CORREC
   T ?";:GOSUB9000:IFA$="N"THEN
   711
6A 873 S1=(S1*8+2048):E1=((E1+1
   )*8+2047):S2=(S2*8+2048)
E3 875 Q=S2-S1
90 880 FORA=S1TOE1:W=PEEK(A):PO
```

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     KEA,PEEK(A+Q):POKEA+Q,(W):NE
     XT:GOTO650
D2   997 :
D3   998 :
D0   999 :
96   1000 PRINTPR$"[DOWN4,SPC4]SW
     AP CHARS"
4B   1005 PRINTPR$"[DOWN6] CHAR 1
      NO ";:A$="":GOSUB9100:S1=A
32   1010 PRINTPR$"[DOWN8] CHAR 2
      NO ";:A$="":GOSUB9100:S2=A
D1   1015 GOSUB712:PRINTPR$"[DOWN
     8] SWAPING"
C5   1020 S1=(S1*8+2048):S2=(S2*8
     +2048)
4E   1025 Q=S2-S1
79   1030 FORX=S1TOS1+7:W=PEEK(X)
     :POKEX,PEEK(X+Q):POKEX+Q,W:N
     EXT:GOTO350
2E   1040 :
DD   1050 A=0:B=0:PRINTPR$"[DOWN6
     ]  INPUT  TOP  LINE ":GOSUB1
     100:IFB$=""THENB$=TE$(A)
70   1051 TE$(A)=B$:B=0
92   1053 A=1:PRINTPR$"[DOWN9]  I
     NPUT BOTTOM LINE":GOSUB1100:
     IFB$=""THENB$=TE$(A)
8F   1055 TE$(A)=B$:GOSUB712
F0   1057 POKE646,C(0)
57   1059 IFMC=1THENPOKE646,C(4)
3A   1060 PRINT"[HOME,DOWN14,SPC1
     0,LEFT12]"TE$(0)
95   1065 PRINT"[SPC15,LEFT12]"TE
     $(1)
C8   1070 GOTO9220
75   1099 :
96   1100 PRINTPR$"[DOWN7]";:IFA=
     1THENPRINT"[DOWN3]";
2B   1101 IFMC=1THENPRINT"[C4]";
38   1105 PRINT"[SPC5,C@,LEFT]";:
     B$=""
D6   1110 GETA$:IFA$=""THEN1110
2F   1112 W=ASC(A$)
6E   1115 IFW=13THENPRINT" ";:RET
     URN
E7   1120 IFW=20ANDB>0THENB$=LEFT
     $(B$,LEN(B$)-1):PRINT"[LEFT,
     C@] [LEFT2]";:B=B-1:GOTO1110
9E   1125 IFW=18ORW=146THEN1138
32   1126 IFW<32THEN1110
93   1130 IF(W>127)AND(W<160)THEN
     1110
31   1132 IFW=34THEN1110
E5   1134 IFB>9THEN1110
65   1136 B=B+1
7E   1138 B$=B$+A$:PRINTA$;"[C@,L
     EFT]";:GOTO1110
BB   1149 :
ED   1150 MC=MC+1:IFMC=2THENMC=0
0C   1160 GOTO1057
89   1199 :
9F   1200 MG=MG+1:IFMG=2THENMG=0
FC   1210 XX=0:YY=0:GOTO100
22   1299 :
62   1300 IFCH=255THEN350
A6   1305 PRINTPR$"[DOWN8,LEFT2]
     PROGRESSING"
6F   1310 FORA=0TO7:POKE((CH+1)*8
     +2048+A),PEEK(CH*8+2048+A):N
     EXT:CH=CH+1:GOTO350
ED   2000 :
9A   2010 A=CH*8+2048:PRINT"[WHIT
     E,HOME]":POKE646,C(1)
29   2015 HI=INT(A/256):LO=A-HI*2
     56:POKE251,LO:POKE252,HI:SYS
     50114
39   2020 IFCH=OCTHEN2050
33   2030 PRINT"[BLUE,HOME,DOWN,S
     PC3]CHARACTER NO.[SPC3,LEFT3
     ]";CH;
CD   2040 PRINTTAB(20)" = ":POKE1
     087,CH:POKE55359,6:POKE1090,
     CH:POKE55362,9:OC=CH
3E   2045 :
A8   2050 PE=PEEK(SS-(40*YY)+XX)
6B   2055 P2=PEEK(SS-(40*YY)+XX+1
     )
B7   2060 POKE253,XX:POKE254,YY
A6   2070 SYS50400:A=0
AE   2080 A=A+1:GETA$:IFA$=""ANDA
     <10THEN2080
F5   2090 IFA=10THEN2070
D4   2091 IFA$=" "ORA$="[REV T]"T
     HEN2320
1E   2092 IFA$="1"ORA$="2"ORA$="3
     "THEN2320
7D   2100 POKE(SS-(40*YY)+XX),PE
FE   2105 POKE(SS-(40*YY)+XX+1),P
     2
6C   2110 IFA$="[UP]"THENYY=YY+1:
     GOTO2190
5D   2120 IFA$="[DOWN]"THENYY=YY-
     1:GOTO2190
8D   2130 IFA$="[LEFT]"THENXX=XX-
     2:GOTO2210
D8   2140 IFA$="[RIGHT]"THENXX=XX
     +2:GOTO2210
01   2150 IFA$=" "ORA$="[SSPC]"TH
     EN2520
BF   2151 IFA$="1"ORA$="2"ORA$="3
     "THEN2520
77   2160 IFA$="+"ANDCH<>255THENC
     H=CH+1:GOTO2010
D0   2170 IFA$="-"ANDCH<>0THENCH=
     CH-1:GOTO2010
38   2180 GOTO300
AB   2185 :
04   2190 IFYY<>-1ANDYY<>8THEN205
     0
AB   2200 GOTO2220
A0   2210 IFXX>-1ANDXX<8THEN2050
7B   2220 IFWRANDA$<>" "ANDA$<>"[
     SSPC]"THEN2280
24   2230 IFXX>7THENXX=6:GOTO2050
D9   2240 IFXX<0THENXX=0:GOTO2050
B5   2250 IFYY=8THENYY=7:GOTO2050
F2   2260 IFYY=-1THENYY=0:GOTO205
     0
DC   2270 :
1A   2280 IFXX=8THENXX=0:GOTO2050
69   2290 IFXX<0THENXX=6:GOTO2050
12   2300 IFYY=8THENYY=0:GOTO2050
A4   2310 IFYY=-1THENYY=7:GOTO205
     0
2E   2315 :
8D   2320 Y=7-YY:X=7-XX:A=(2[UPAR
     ROW]X):B=(2[UPARROW](X-1)):C
     =(AORB):P=(CH*8+2048+Y):D=PE
     EK(P)
37   2330 IF(DANDC)ANDA$=" "THENE
     =(DAND(255-C)):GOTO2400
5D   2340 E=(DAND(255-C))
42   2350 IFA$="1"ORA$=" "THENF=C
     :GOTO2390
D7   2360 IFA$="2"THENF=B:GOTO239
     0
E8   2370 IFA$="3"THENF=A
EE   2380 IFA$="[REV T]"THEN2400
F6   2390 E=(EORF)
A7   2400 POKEP,E
45   2410 IFAD=0THEN2010
41   2420 XX=XX+2:IFA$="[REV T]"T
     HENXX=XX-4
D8   2430 IFXX=8ANDWR=1THENXX=0:G
     OTO2010
7D   2440 IFXX=8THENXX=6:GOTO2010
D9   2450 IFXX<0ANDWR=1THENXX=6:G
     OTO2010
BA   2460 IFXX<0THENXX=0:GOTO2010
A9   2470 GOTO2010
0B   2599 :
12   2600 B=0
D6   2605 IFB=-1THENB=7
D8   2606 IFB=8THENB=0
11   2610 A=0:GOSUB2700:PRINTPR$"
     [DOWN3,RIGHT]NORMAL COLOUR[R
     VSOFF,SPC3,LEFT3]";C(0)
F2   2620 GOSUB2700:PRINTPR$"[DOW
     N4,LEFT2]MUL/COL MAIN COL[RV
     SOFF,SPC3,LEFT3]";C(1)
89   2630 GOSUB2700:PRINTPR$"[DOW
     N5,RIGHT8]M/C #1[RVSOFF,SPC3
     ,LEFT3]";C(2)
26   2640 GOSUB2700:PRINTPR$"[DOW
     N6,RIGHT8]M/C #2[RVSOFF,SPC3
     ,LEFT3]";C(3)
E2   2650 GOSUB2700:PRINTPR$"[DOW
     N7,LEFT2]M/C PRINT COLOUR[RV
     SOFF,SPC3,LEFT3]";C(4)
D3   2660 GOSUB2700:PRINTPR$"[DOW
     N8,RIGHT]BORDER COLOUR[RVSOF
     F,SPC3,LEFT3]";C(5)
D2   2665 GOSUB2700:PRINTPR$"[DOW
     N9,LEFT4]S/PAD NORM. COLOUR[
     RVSOFF,SPC3,LEFT3]";C(6)
2D   2667 GOSUB2700:PRINTPR$"[DOW
     N10,LEFT2]S/PAD M/C COLOUR[R
     VSOFF,SPC3,LEFT3]";C(7)
BC   2670 PRINTPR$"[BLUE,DOWN12,L
     EFT4]USE  F1-UP  F3-DOWN"
87   2680 PRINTPR$"[BLUE,DOWN13,L
     EFT5]'+' & '-' TO ALTER"
43   2690 PRINTPR$"[BLUE,DOWN14,L
     EFT4]'RETURN' TO EXIT"
9B   2698 GOTO2730
AF   2699 :
6B   2700 IFA=BTHENPRINT"[RVSON]"
     ;
09   2710 A=A+1:RETURN
B9   2730 POKE198,0
69   2735 GETA$:IFA$=""THEN2735
2B   2740 IFA$=CHR$(13)THEN99
A8   2750 IFA$="[F1]"THENB=B-1:GO
     TO2605
E6   2760 IFA$="[F3]"THENB=B+1:GO
     TO2605
53   2770 IFA$="[F1]"ORA$="[F3]"T
     HEN2730
60   2780 IFA$="+"THENC(B)=C(B)+1
     :GOTO2800
BD   2790 IFA$="-"THENC(B)=C(B)-1
     :GOTO2800
FC   2795 GOTO2730
C3   2799 :
60   2800 IFC(B)=-1THENC(B)=15
90   2801 IFC(B)=16THENC(B)=0
0A   2802 A=CH*8+2048:HI=INT(A/25
     6):LO=A-HI*256:POKE251,LO:PO
     KE252,HI
5C   2805 POKE53282,C(2):POKE5328
     3,C(3):POKE49991,C(0):POKE64
     6,C(1):POKE55362,C(4)
85   2807 POKE55359,C(0)
DC   2810 IFMG=1THENSYS50114:GOTO
     2830
37   2820 SYS49946
2C   2830 IFB=4ORB=0THEN2890
6B   2840 IFB<>5THEN2610
B5   2850 POKE646,C(5):PRINT"[HOM
     E,DOWN2,SPC4]01234567"
4A   2860 PRINT"[SPC3,RVSON,CV10,
     RVSOFF]"
51   2870 FORA=0TO7:PRINT" ";A;"[
     LEFT,RVSON,CV,RVSOFF,RIGHT8,
     RVSON,CV,RVSOFF]":NEXT
A6   2880 PRINT"[SPC3,RVSON,CV10,
     RVSOFF]"
5E   2885 GOTO2610
34   2890 POKE646,C(0):IFMC=1THEN
     POKE646,C(4)
2F   2900 PRINT"[HOME,DOWN14,SPC3
     ]"TE$(0)
A1   2910 PRINT"[SPC3]"TE$(1)
E3   2920 PRINT"[HOME.DOWN17]";AL
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    $;"[RIGHT3]![RIGHT]"CHR$(34)
    ;CH$:PRINTC2$"[BLUE,HOME]"
71  2930 GOTO2610
F8  2999 :
0D  3000 PRINTPR$"[DOWN3,SPC5]ST
    ATUS"
DA  3010 PRINTPR$"[DOWN5]  ADVAN
    CE ";
B9  3020 IFAD=1THENPRINT"ON":GOT
    O3040
7F  3030 PRINT"OFF"
FF  3040 PRINTPR$"[DOWN6] WRAP R
    OUND ";
72  3050 IFWR=1THENPRINT"ON":GOT
    O3070
6D  3060 PRINT"OFF"
EB  3070 PRINTPR$"[DOWN8]NORMAL
    COLOUR"C(0)
DE  3080 PRINTPR$"[DOWN9] MULTI
    COLOUR"C(1)
0E  3090 PRINTPR$"[DOWN10,SPC7]M
    /C #1"C(2)
AD  3100 PRINTPR$"[DOWN11,SPC7]M
    /C #2"C(3)
AF  3110 PRINTPR$"[DOWN12]S/PAD
    COLOUR ";C(6)
B9  3120 PRINTPR$"[DOWN13]  M/C
    COLOUR ";C(7)
C8  3150 PRINTPR$"[DOWN15,SPC3]P
    RESS A KEY[HOME]"
AB  3160 WAIT198,1
5F  3170 GOTO350
D5  3299 :
AA  3300 PRINTPR$"[DOWN3,SPC3]SC
    ROLL MODE"
19  3310 PRINTPR$"[DOWN5,SPC3]'S
    PACE' TO EXIT"
91  3320 GETA$:IFA$=""THEN3320
EE  3330 IFA$=" "THEN350
B9  3340 IFA$="[UP]"THENSYS50342

23  3350 IFA$="[DOWN]"THENSYS503
    71
1E  3360 IFA$="[RIGHT]"THENSYS50
    314
4A  3370 IFA$="[LEFT]"THENSYS502
    86
B5  3380 A=CH*8+2048:HI=INT(A/25
    6):LO=A-HI*256:POKE251,LO:PO
    KE252,HI
85  3390 IFMG=1THENSYS50114
81  3400 IFMG=0THENSYS49946
5C  3410 GOTO3320
82  3499 :
1A  4999 END
62  5000 PRINT"[CLR,SPC7]PRESET
    CHARS FOR TEST"
8E  5001 PRINT"[DOWN,SPC9]DEFINI
    TION METHOD "
28  5002 PRINT"[SPC5]CHARACTER O
    R NUMBER (N/C) "
CE  5003 GETA$:IFA$<>"C"ANDA$<>"
    N"THEN5003
22  5008 PRINT"[DOWN] PRESET CHA
    RS.="
7D  5010 FORK=0TO9STEP2
95  5015 PRINTK"= ";RT$(K);" =";
    RT(K),K+1"= ";RT$(K+1);" ="R
    T(K+1):NEXT
E4  5020 PRINT"[HOME,DOWN11]"
03  5025 IFA$="N"THEN5100
4C  5030 FORX=0TO9:PRINT"[SPC4]N
    EW PRESET ON ";X;
CB  5040 GETA$:IFA$=""THEN5040
F2  5045 :
35  5050 A=ASC(A$):IFA=13THENA$=
    RT$(X):A=32
FC  5060 IFA=34THEN5040
8E  5061 IFA<32THEN5040
E6  5062 IFA>127ANDA<160THEN5040

0F  5064 RT$(X)=A$:PRINTA$:NEXT
F2  5065 PRINT"[DOWN,SPC5]CORREC
    T ? ";:GOSUB9000
20  5070 FORK=0TO9:PRINT"[C7,HOM
    E]";RT$(K):RT(K)=PEEK(1024):
    NEXT:PRINT"[HOME] [BLUE]"
6D  5080 IFA$="N"THEN5000
B7  5090 IFRT=1THENRT=0:GOTO6000

95  5095 GOTO99
C4  5099 :
2C  5100 FORX=0TO9:PRINT"[SPC4]N
    EW PRESET ON ";X;:A$=STR$(RT
    (X)):GOSUB9100
12  5105 IFA>255ORA<0THENX=X-1:P
    RINT"[UP]":NEXT
76  5110 RT(X)=A:PRINT:NEXT
40  5117 FORX=0TO9:A=RT(X)
FC  5118 FL=0:IFA>127THENFL=1:A=
    A-128
92  5120 IFA>31ANDA<64THENB=A:GO
    TO5130
AE  5121 B=A+64:IFB>63ANDB<96THE
    N5130
B5  5122 IFB>159ANDB<192THEN5130

A6  5123 B=A+32:IFB>95ANDB<128TH
    EN5130
61  5130 RT$(X)=CHR$(B):IFFLTHEN
    RT$(X)="[RVSON]"+RT$(X)+"[RV
    SOFF]"
A1  5135 NEXT
29  5140 GOTO5065
BC  5999 :
87  6000 PRINT"[CLR]":CC=C(6)
00  6005 IFMM=1THENCC=C(7)
14  6010 POKE49896,CC
3E  6015 SYS49830
E6  6018 X=0:Y=0
90  6020 LO=40*Y+1024+X:PE=PEEK(
    LO):PO=PE+128:IFPO>255THENPO
    =PO-256
3B  6025 POKELO,PO:POKE54272+LO,
    CC
A6  6030 A=0
D9  6035 A=A+1:GETA$:IFA$=""ANDA
    <15THEN6035
DD  6040 IFA=15ANDPO>127THENPO=P
    O-128:GOTO6025
7A  6045 IFA=15THENPO=PO+128:GOT
    O6025
76  6050 POKELO,PE
54  6055 IFA$="[RIGHT]"THENX=X+1
    :GOTO6080
0C  6060 IFA$="[LEFT]"THENX=X-1:
    GOTO6080
AF  6065 IFA$="[DOWN]"THENY=Y+1:
    GOTO6089
77  6070 IFA$="[UP]"THENY=Y-1:GO
    TO6089
E0  6075 GOTO6100
EC  6079 :
68  6080 IFX=-1ORX=40THEN6090
DD  6085 GOTO6020
40  6089 IFY<>-1ANDY<>25THEN6020

99  6090 IFWR=1THEN6095
AB  6091 IFX=-1THENX=0:GOTO6020
F4  6092 IFX=40THENX=39:GOTO6020

DF  6093 IFY=-1THENY=0:GOTO6020
F3  6094 IFY=25THENY=24:GOTO6020

E7  6095 IFX=-1THENX=39:GOTO6020

C4  6096 IFX=40THENX=0:GOTO6020
F9  6097 IFY=-1THENY=24:GOTO6020

E9  6098 IFY=25THENY=0:GOTO6020
D0  6099 :
EB  6100 POKE198,0:K=ASC(A$)
64  6110 IFA$<"0"ORA$>"9"THEN615
    0
F3  6120 POKELO,RT(VAL(A$)):POKE
    54272+LO,CC
8F  6125 IFRE=1THENPOKELO,RT(VAL
    (A$))+128
FB  6130 IFAD=1THENX=X+1:GOTO608
    0
22  6140 GOTO6020
23  6145 :
0C  6150 IF(K<32)THEN6200
38  6160 IF(K>127)AND(K<160)THEN
    6200
DB  6170 K=PEEK(1024):POKE55296,
    14:PRINT"[PURPLE,HOME]"A$:I=
    PEEK(1024):POKE1024,K:POKE55
    296,6
E9  6180 PRINT"[BLUE]":POKELO,I:
    POKE54272+LO,CC:IFRE=1THENPO
    KELO,I+128
57  6190 GOTO6130
71  6195 :
69  6200 IFA$="[REV T]"THENPOKEL
    O,32:X=X-1:GOTO6080
2D  6210 IFA$="[F1]"THENPOKE5328
    1,1:SYS49807:POKE53281,14:GO
    TO6020:REM F1
15  6220 IFA$="[F2]"THEN99:REM F
    2
A2  6230 IFA$="[F3]"THENPOKE5328
    1,1:SYS49807:POKE53281,14:GO
    TO99  :REM F3
15  6240 IFA$="[CLR]"THENPRINT"[
    CLR]":GOTO6020
61  6250 IFA$="[HOME]"THEN6018
75  6260 IFA$="[F4]"THENRT=1:GOT
    O5000:REM F4
EB  6270 IFA$="[F6]"THENGOTO6010
         :REM F6
7B  6280 IFA$<>"[F5]"THEN6320:RE
    M F5
EE  6290 IFMM=1THENMM=0:CC=C(6):
    GOTO6310
02  6300 IFMM=0THENMM=1:CC=C(7)
76  6310 POKE53281,0:FORA=0TO30:
    NEXT:POKE53281,14:POKE49896,
    CC:GOTO6020
B2  6320 IFASC(A$)<>13THEN6350
75  6330 RE=RE+1:IFRE=2THENRE=0
D9  6340 GOTO6310
DC  6350 :
03  6999 GOTO6020
7C  8995 :
7D  8996 :
72  8997 :
7E  9000 PRINT"(Y/N) ";
52  9010 GETA$:IFA$<>"Y"ANDA$<>"
    N"ANDA$<>"Q"THEN9010
10  9020 IFA$="Q"THEN997
15  9030 PRINTA$
FD  9040 RETURN
97  9098 :
94  9099 :
BA  9100 PRINT"[SPC5,LEFT5]";A$;
    "[C@,LEFT]";:IFA$<>""THENA=L
    EN(A$)-1:A$=RIGHT$(A$,A)
E6  9105 GETB$:IFB$=""THEN9105
F2  9110 IFASC(B$)>47ANDASC(B$)<
    58ANDLEN(A$)<3THENGOSUB9130
ED  9115 IFASC(B$)=20THENGOSUB91
    45
7F  9120 IFASC(B$)=13THEN9165
4E  9125 GOTO9105
6A  9130 PRINTB$"[C@,LEFT]";
72  9135 A$=A$+B$
59  9140 RETURN
53  9145 IFLEN(A$)=0THENRETURN
2E  9150 PRINT" [LEFT2,C@,LEFT]"
    ;
D9  9155 A$=LEFT$(A$,(LEN(A$)-1)
    )
65  9160 RETURN
91  9165 A=VAL(A$):IFA>255THEN91
    05
EB  9170 PRINT" ";
74  9175 RETURN
28  9199 :
FD  9200 PRINT"[CLR]":POKE646,C(
    5)
0E  9201 PRINT"[HOME,DOWN2,SPC4]
```

```
    01234567"
9D  9205 PRINT"[SPC3,RVSON,CV10,
    RVSOFF]"
E5  9210 FORA-0TO7:PRINT" ";A;"[
    LEFT,RVSON,CV,RVSOFF,SPC8,RV
    SON,CV,RVSOFF]":NEXT
5F  9215 PRINT"[SPC3,RVSON,CV10,
    RVSOFF]"
69  9216 POKE646,C(0):IFMC-1THEN
    POKE646,C(4)
F9  9217 PRINT"[DOWN,SPC3]"TE$(0
    )
5A  9218 PRINT"[SPC3]"TE$(1)
68  9220 PRINT"[HOME,DOWN17]";AL
    $;"[RIGHT3]![RIGHT]"CHR$(34)
    ;CH$:PRINTC2$"[BLUE,HOME]"
88  9235 IFMG-0GOTO100
38  9240 GOTO2010
0F  9998 :
0C  9999 :
2A  60000 CO-26
24  60010 DIMCO$(CO),TE$(1),RT(9
    ),RT$(9)
43  60020 DIMC(7)
96  60098 :
97  60099 :
44  60200 AL$=" A B C D E F G H
    I J K L M N O P Q R S [DOWN,
    RIGHT2]T U V W X Y Z "
1B  60210 AL$-AL$+"[SPC4]1 2 3 4
     5 6 7 8 9 0[DOWN]"
B9  60220 CH$-" # $ % & ' ( ) +
    - [POUND] @ * [UPARROW] [LAR
    ROW] : ; =  "
47  60230 C2$-"[SPC13], . / [ ]
    < > "
90  60240 PR$-"[BLUE,HOME,RIGHT1
    0]"
4F  60298 :
4C  60299 :
CF  60300 XX=0:YY=0:CC-6:MM-0
C8  60310 SS=1468:CS=55740:TS=17
    44
BD  60330 TC=TS+54272
E3  60398 :
E0  60399 :
D5  60400 TE$(0)="QWERTYUIOP":TE
    $(1)-TE$(0)
D0  60410 FORK-0TO9:RT$(K)-RIGHT
    $(STR$(K),1):RT(K)-K+48:NEXT
E4  60500 RESTORE:FORX-1TOCO:REA
    DCO$(X):NEXT
5A  60510 DATA D,A,W,Q,H,V,I,R,"
    [F1]",P,"[F3]"
AA  60520 DATA "[CLR]","[HOME]",
    ",",;,.,C,F,B,S,T,M
B1  60530 DATA [LARROW],"[F5]",*
    ,@,[UPARROW]
09  60997 :
0E  60998 :
8B  61000 PRINT"[CLR,BLUE,REV H]
    "
DF  61010 POKE49592,12
1F  61020 POKE53270,PEEK(53270)O
    R16
54  61030 REM POKE198,0
6D  61040 POKE650,128
53  61050 POKE53280,6
DD  61060 POKE53281,14
C1  61070 POKE53282,0:C(2)-0
01  61080 POKE53283,7:C(3)-7
65  61090 C(0)-1:C(1)-1:C(4)=9:C
    (5)-6
8F  61100 C(6)-6:C(7)-11
25  61997 :
1A  61998 :
76  63999 RETURN
```

PROGRAM: CHAR ED M/C LOAD

```
84  1 REM ***********************
    ***********
B1  2 REM * THIS POKES THE M/C F
    OR THE     *
97  3 REM * CHARACTER EDITOR INT
    O MEMORY  *
84  4 REM * AND THEN SAVES IT OU
    T AS A M/C*
95  5 REM * FILE FOR USE BY THE
    BASIC PART*
41  6 REM * OF THE PROGRAM.
                 *
8D  8 REM ***********************
    ***********
2F  10 BL-83    :LN-50    :SA-4915
    2
5B  20 FOR L=0 TO BL:CX-0:FOR D-
    0 TO 15:READ A:CX-CX+A:POKE
    SA+L*16+D,A:NEXT D
A5  30 READ A:IF A><CX THENPRINT
    "ERROR IN LINE";LN+(L*10):ST
    OP
86  40 NEXT L
A1  50 DATA 0,0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0
75  60 DATA 32,42,192,169,251,16
    2,0,160,16,32,216,255,96,32,
    42,192,1889
10  70 DATA 169,0,162,255,160,25
    5,32,213,255,96,160,255,162,
    8,169,8,2359
C3  80 DATA 32,186,255,165,170,1
    62,0,160,192,32,189,255,96,0
    ,0,36,1930
91  90 DATA 0,32,203,192,32,68,2
    29,169,14,162,8,160,96,32,18
    6,255,1838
AF  100 DATA 169,1,162,63,160,19
    2,32,189,255,169,36,141,63,1
    92,32,192,2048
77  110 DATA 255,169,8,32,180,25
    5,169,96,32,150,255,169,0,13
    3,144,160,2207
B9  120 DATA 3,132,183,32,165,25
    5,133,193,164,144,208,70,32,
    165,255,133,2267
11  130 DATA 194,164,144,208,61,
    164,183,136,208,231,166,193,
    165,194,32,205,2648
11  140 DATA 189,169,32,32,210,2
    55,32,165,255,166,144,208,37
    ,201,0,240,2335
0C  150 DATA 24,32,210,255,32,22
    5,255,240,25,32,228,255,240,
    232,201,32,2518
33  160 DATA 208,228,76,26,193,2
    34,234,234,234,169,13,32,210
    ,255,160,2,2508
0B  170 DATA 208,175,32,204,255,
    169,14,76,10,193,0,32,226,19
    2,169,69,2024
9E  180 DATA 32,221,237,169,66,3
    2,221,237,169,208,32,221,237
    ,76,254,237,2649
DC  190 DATA 234,234,169,8,32,12
    ,237,169,111,32,185,237,169,
    77,32,221,2159
8C  200 DATA 237,169,45,76,221,2
    37,165,195,133,174,165,196,1
    33,175,169,224,2714
B9  210 DATA 141,40,3,169,193,14
    1,41,3,96,0,169,237,141,40,3
    ,169,1586
8D  220 DATA 246,141,41,3,169,14
    ,76,195,255,0,32,228,255,201
    ,0,240,2096
92  230 DATA 249,201,32,208,3,76
    ,150,192,76,194,192,0,0,32,5
    8,193,1856
02  240 DATA 169,0,162,0,160,8,3
    2,213,255,96,160,0,162,8,169
    ,8,1602
5D  250 DATA 32,186,255,165,170,
    162,0,160,192,32,189,255,96,
    0,0,0,1894
D3  260 DATA 169,208,133,252,169
    ,8,133,254,169,0,133,251,133
    ,253,120,165,2550
69  270 DATA 1,41,251,133,1,160,
    0,177,251,145,253,200,208,24
    9,230,252,2552
F8  280 DATA 230,254,165,252,201
    ,224,208,239,165,1,9,4,133,1
    ,88,96,2270
A5  290 DATA 120,169,145,141,20,
    3,169,193,141,21,3,88,169,48
    ,133,2,1565
44  300 DATA 96,72,152,72,138,72
    ,165,2,201,0,240,4,198,2,208
    ,50,1672
38  310 DATA 165,197,201,3,208,4
    4,169,4,44,24,208,240,18,173
    ,24,208,1930
32  320 DATA 41,240,9,2,141,24,2
    08,169,12,141,32,208,76,206,
    193,173,1875
CB  330 DATA 24,208,41,240,9,4,1
    41,24,208,169,6,141,32,208,1
    69,48,1672
F5  340 DATA 133,2,104,168,104,1
    70,104,76,49,234,0,162,0,189
    ,248,193,1936
CD  350 DATA 73,255,157,208,15,2
    32,224,24,208,243,162,0,189,
    248,193,157,2588
D2  360 DATA 232,15,232,224,24,2
    08,245,96,255,255,255,255,25
    5,255,0,0,2806
D4  370 DATA 255,255,255,255,255
    ,255,255,255,192,192,192,192
    ,192,192,255,255,3702
AF  380 DATA 76,27,194,0,0,0,0,0
    ,0,0,0,160,0,177,251,153,103
    8
A3  390 DATA 19,194,200,192,8,20
    8,246,162,7,160,0,189,19,194
    ,145,251,2194
4D  400 DATA 200,202,224,255,208
    ,245,96,76,67,194,0,0,0,0,0,
    0,1767
D0  410 DATA 0,0,0,160,0,177,251
    ,153,58,194,200,192,8,208,24
    6,160,2007
E4  420 DATA 0,169,128,133,253,1
    69,1,133,254,169,0,141,66,19
    4,185,58,2053
69  430 DATA 194,37,253,240,9,24
    ,173,66,194,101,254,141,66,1
    94,24,102,2072
5B  440 DATA 253,24,38,254,144,2
    32,173,66,194,145,251,200,19
    2,8,208,209,2591
6A  450 DATA 96,160,0,177,251,73
    ,255,145,251,200,192,8,208,2
    45,96,169,2526
87  460 DATA 0,141,194,194,169,4
    ,141,195,194,169,0,141,197,1
    94,169,204,2306
E1  470 DATA 141,198,194,76,189,
    194,169,0,141,194,194,169,20
    4,141,195,194,2593
7B  480 DATA 169,0,141,197,194,1
    69,4,141,198,194,76,189,194,
    162,0,160,2188
B6  490 DATA 4,189,0,207,157,0,7
    ,232,208,247,136,208,3,76,21
    7,194,2085
BE  500 DATA 238,195,194,238,198
    ,194,76,193,194,169,0,141,23
    4,194,169,216,2843
A5  510 DATA 141,235,194,162,0,1
    60,4,169,6,157,0,219,232,208
    ,250,136,2273
BA  520 DATA 208,1,96,238,235,19
```

```
    4,76,231,194,0,0,0,0,0,0,0,1
    473
47  530 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0,0
C5  540 DATA 0,0,0,0,0,0,0,0,0,0
    ,169,4,141,69,195,169,747
51  550 DATA 216,141,74,195,169,
    162,141,68,195,141,73,195,16
    9,128,141,123,2331
57  560 DATA 195,160,0,162,2,177
    ,251,45,123,195,208,5,169,25
    5,76,67,2090
C5  570 DATA 195,169,254,157,226
    ,5,169,1,157,226,217,232,24,
    110,123,195,2460
A0  580 DATA 144,227,169,128,141
    ,123,195,24,173,68,195,105,4
    0,141,68,195,2136
FE  590 DATA 144,3,238,69,195,24
    ,173,73,195,105,40,141,73,19
    5,144,3,1815
7B  600 DATA 238,74,195,162,2,20
    0,192,8,208,187,96,128,169,5
    ,133,252,2249
14  610 DATA 169,188,133,251,166
    ,254,224,0,240,15,202,56,165
    ,251,233,40,2587
D5  620 DATA 133,251,176,242,198
    ,252,76,134,195,164,253,177,
    251,201,255,240,3198
4E  630 DATA 13,201,254,240,14,2
    01,252,240,15,201,251,240,16
    ,96,169,252,2655
8D  640 DATA 145,251,96,169,251,
    145,251,96,169,255,145,251,9
    6,169,254,145,2888
02  650 DATA 251,96,169,4,141,0,
    196,169,216,141,53,196,169,1
    64,141,255,2361
34  660 DATA 195,141,52,196,160,
    0,162,0,177,251,141,107,196,
    173,107,196,2254
62  670 DATA 41,192,141,108,196,
    240,5,169,254,76,238,195,169
    ,255,32,254,2565
8C  680 DATA 195,232,201,255,208
    ,2,169,250,32,254,195,76,2,1
    96,157,188,2612
27  690 DATA 5,96,202,173,108,19
    6,201,0,240,13,201,192,240,9
    ,201,128,2205
7C  700 DATA 240,11,201,64,240,1
    3,96,173,134,2,76,41,196,173
    ,35,208,1903
A9  710 DATA 76,41,196,173,34,20
    8,76,41,196,32,51,196,232,32
    ,51,196,1831
86  720 DATA 76,55,196,157,188,2
    17,96,232,24,46,107,196,46,1
    07,196,224,2163
53  730 DATA 8,240,3,76,221,195,
    24,200,192,8,208,1,96,173,25
    5,195,2095
CE  740 DATA 105,40,141,255,195,
    144,3,238,0,196,24,173,52,19
    6,105,40,1907
BA  750 DATA 141,52,196,144,3,23
    8,53,196,76,214,195,0,0,0,16
    0,0,1668
09  760 DATA 177,251,141,137,196
    ,24,41,128,240,1,56,46,137,1
    96,173,137,2081
7A  770 DATA 196,145,251,200,192
    ,8,208,232,96,0,160,0,177,25
    1,141,165,2422
F6  780 DATA 196,24,41,1,240,1,5
    6,110,165,196,173,165,196,14
    5,251,200,2160
56  790 DATA 192,8,208,232,96,0,
    160,0,177,251,141,194,196,16
    0,1,177,2193
51  800 DATA 251,136,145,251,200
    ,200,192,8,208,245,173,194,1
    96,160,7,145,2711
F2  810 DATA 251,96,0,160,7,177,
    251,141,223,196,160,6,177,25
    1,200,145,2441
7A  820 DATA 251,136,136,192,255
    ,208,245,173,223,196,160,0,1
    45,251,96,0,2667
92  830 DATA 169,5,133,252,169,1
    88,133,251,166,254,224,0,240
    ,15,202,56,2457
66  840 DATA 165,251,233,40,133,
    251,176,242,198,252,76,234,1
    96,164,253,177,3041
0E  850 DATA 251,201,255,240,13,
    201,254,240,19,201,252,240,2
    3,201,251,240,3082
A5  860 DATA 29,96,169,252,145,2
    51,200,169,253,145,251,96,16
    9,251,145,251,2872
2D  870 DATA 200,145,251,96,169,
    255,145,251,200,169,250,145,
    251,96,169,254,3046
8E  880 DATA 145,251,200,145,251
    ,0,0,0,0,0,0,0,0,0,0,0,992
25  1000 REM * SAVE SECTION OF P
    ROGRAM *
CB  1010 PRINT"[CLR,DOWN3]PRESS
    A KEY TO SAVE"
D9  1020 GET K$:IF K$="" THEN 10
    20
E3  1030 POKE 43,0:POKE44,192:PO
    KE45,55:POKE46,197
A1  1040 SAVE "CHAR CODE",8
```

Next month we will take a closer look at the function of each command and also give changes for tape users.

Spanner in the Works

If you rely heavily on your computer for business or leisure activities, then a breakdown can be infuriating. Here are a few tips on simple fault finding and repairs.

By Mike Roberts

The entire range of Commodore computers set high standards in design, production and reliability.

All the hardware is built up to a specification rather down to a price, unlike one or two of its competitors.

Opening up any Commodore computer will show a large number of integrated circuits which are the chips that make the computer work. However, they are usually the first items to produce problems when anything serious malfunctions in your computer.

There can be other reasons for your machine's failure, and many are serious. If your guarantee has expired, you may be faced with a hefty bill.

However, all is not lost. You can usually trace the cause of a breakdown to one or more of the ICs. Replace the chip, and the problem is solved.

Following a simple check list, can save pounds when it comes to repairs.

Your Options

Imagine a nightmare situation. You set up your C64, plug everything in, and connect the screen turn it all on, and nothing! The screen is blank and the keyboard dead.

What can you do?

Firstly, you should check the LED on the top of the machine. If this is off then the power supply has probably blown. This is the only situation (excepting the unlikely event of the LED failing) in which the LED will not light up. If the LED is alright, then you must test the computer.

Going Inside

First, connect a tape deck, insert a tape in the usual manner, and press shift-run/stop. If the tape is dead then so is the computer.

The next step is to check the internals of the machine. Remember that the LED power is tapped from the supply before the fuse. The computer takes its power after the fuse. So this is the first thing that must be checked. If it has blown then you've located the problem, and you can fix it quite simply.

The fuse only costs a few pence and is of the type BEL 3AG, one amp 250V. It is located on the right hand side near the power socket close to the regulating and rectifying circuitry. If the fuse is whole, then the only other explanation is that a section of this circuitry is blown. But this is rare, and you would usually see the damage as blackened fused components. If this is the case then you need professional help.

Chip Testing

If the computer is just behaving oddly

then you need to ascertain which chip is causing the trouble. A lack of screen display usually means that the video output circuitry has blown, as this involves a lot of discrete components. You will also need professional help for this. The chip can be tested by plugging it into a friend's C64 to see if the same problem re-occurs.

This technique of using another C64 to test chips is relatively safe, but be careful not to force chips or bend pins. Make sure you earth your hands by touching something metal before handling any components.

If your video circuitry is OK then any other problem will generate a screen display from which you may be able to diagnose a fault.

Junk on the screen with a regular pattern and an underlying picture of the correct display indicates a RAM problem. Professional service again I'm afraid.

Absolute silence obviously indicates a dead sound chip. The sound circuitry is very robust, and it is usually the chip that is the first to go.

If the ROMs fail, then you will be left with a blank screen. Although this is very unlikely as these are amongst the most reliable chips in the machine. A dead processor will also exhibit symptoms similar to this.

The remaining main chips are the I/0 6569 type. There are two types of these, U1 handles the keyboards and joysticks. Junk being typed out on the screen as soon as you turn it on, or a dead keyboard, indicates either a fault with this chip or its support circuitry. Alternatively, older machines may have their keyboards full of dust. Cleaning will solve the problem.

The other chip, U2, handles most of the main I/O with the user port and series I/O.

The problem here is that it is difficult to distinguish whether the fault lies with the chip at U2 or the device currently in use e.g. the disk drive.

Summing Up

If you follow these simple tips you may be able to rectify a small fault yourself, or at least have some idea of what has malfunctioned.

If the fault is more complex, you need to find a good repair shop. In this case, it is better to use a larger organisation rather than a one horse outfit, and preferably one that specialises in Commodore computers.

YC

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B R E A K

We omitted to mention last month that our C64 Letter Writer program will work on tape as well as disk. It will therefore be available on our April tape at £4.00, the usual charge. Send your order to the address on our Software for Sale page.

Also in relation to Software for Sale, please remember that all our disks and tapes are still available right back to March 1986. Just look up the order code in a back issue of *Your Commodore* and send it to our Readers Services department, they'll do the rest.

Diskit 1, 2 and 3

We apologise for the bad quality of the printing in our Diskit article in the March issue of *Your Commodore*. We realise that this is very difficult to decipher and therefore if you want a clean copy of the article please write to the editorial address which you will find at the bottom of this page and we will send you a photocopy as soon as possible.

Also we have heard that some issues of *Your Commodore* had bad quality printing on Diskit 4 in the April issue and we can also include a copy of this for you.

Bug Finder

We'd like to remind our readers that we run a Bug Finder service.

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Should any of the above be missing then we will not be able to deal with your query.

We will try to point out where you have made errors and place a corrected copy of the program back on to your tape or disk before we return it to you.

Do not send a program to us as soon as it stops working, please check it several times first.

We do get a large number of queries and so it may take a while for us to deal with yours personally.
Note:we can only deal with problems relating to programs published in *Your Commodore*.

Congratulations

Our February issue gave 10 lucky readers the chance to win a super Konix Speed King joystick. The joystick features excellent grip and its response its first class. The 10 winners who will no doubt be zapping new high scores are: Ian Hutchings, Corby; Stathis Damianos, Greece; Keri Hiles, Swansea; Mr Derek Rafferty, Edinburgh; D.R. Brock, Torrington; C. Tatham, Nottingham; Salvatore Barraco, Aberdeen; Nicholas Longson, Macclesfield; Darren Killick, Warminster; Daniel Dricot, Belgium.

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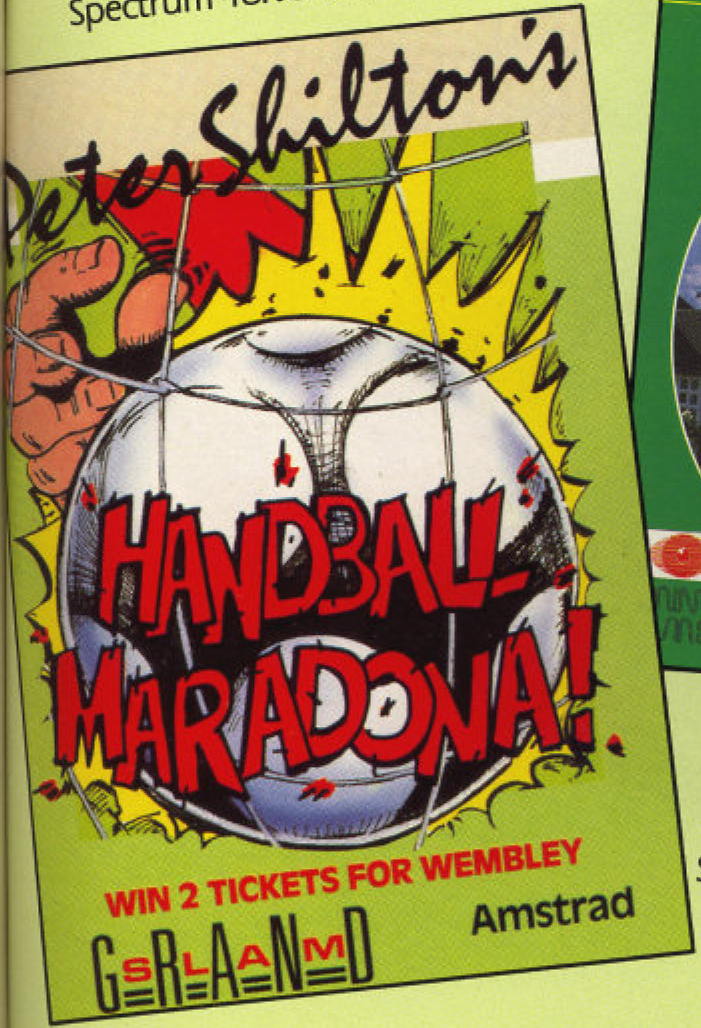
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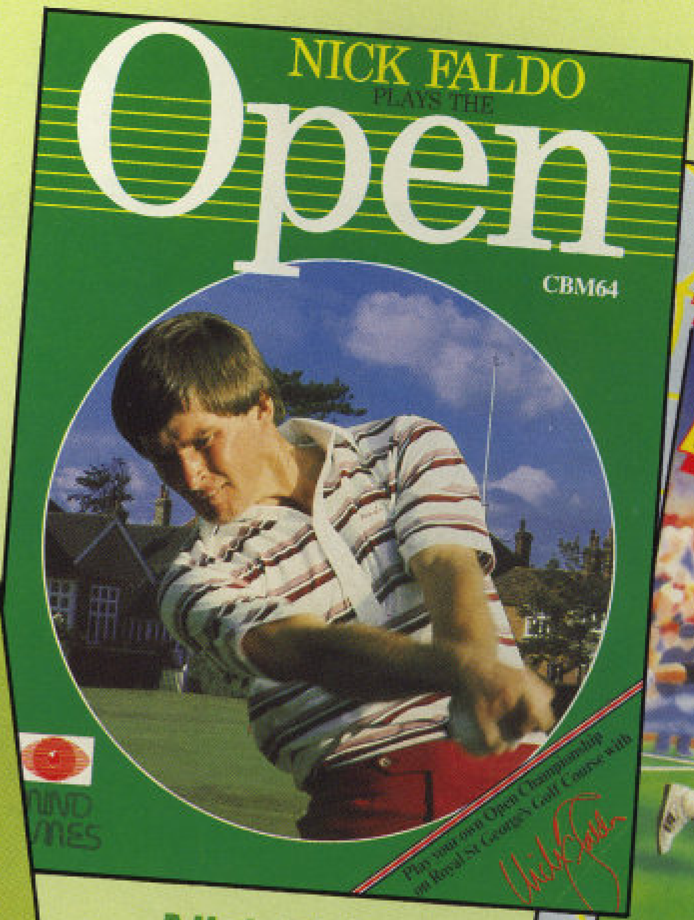
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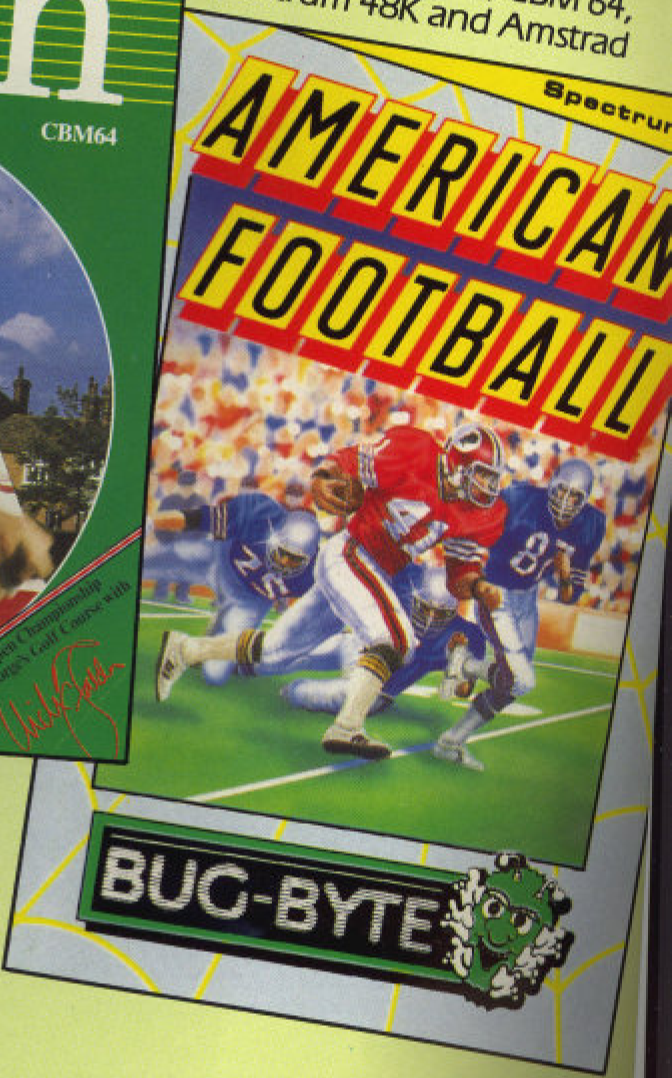
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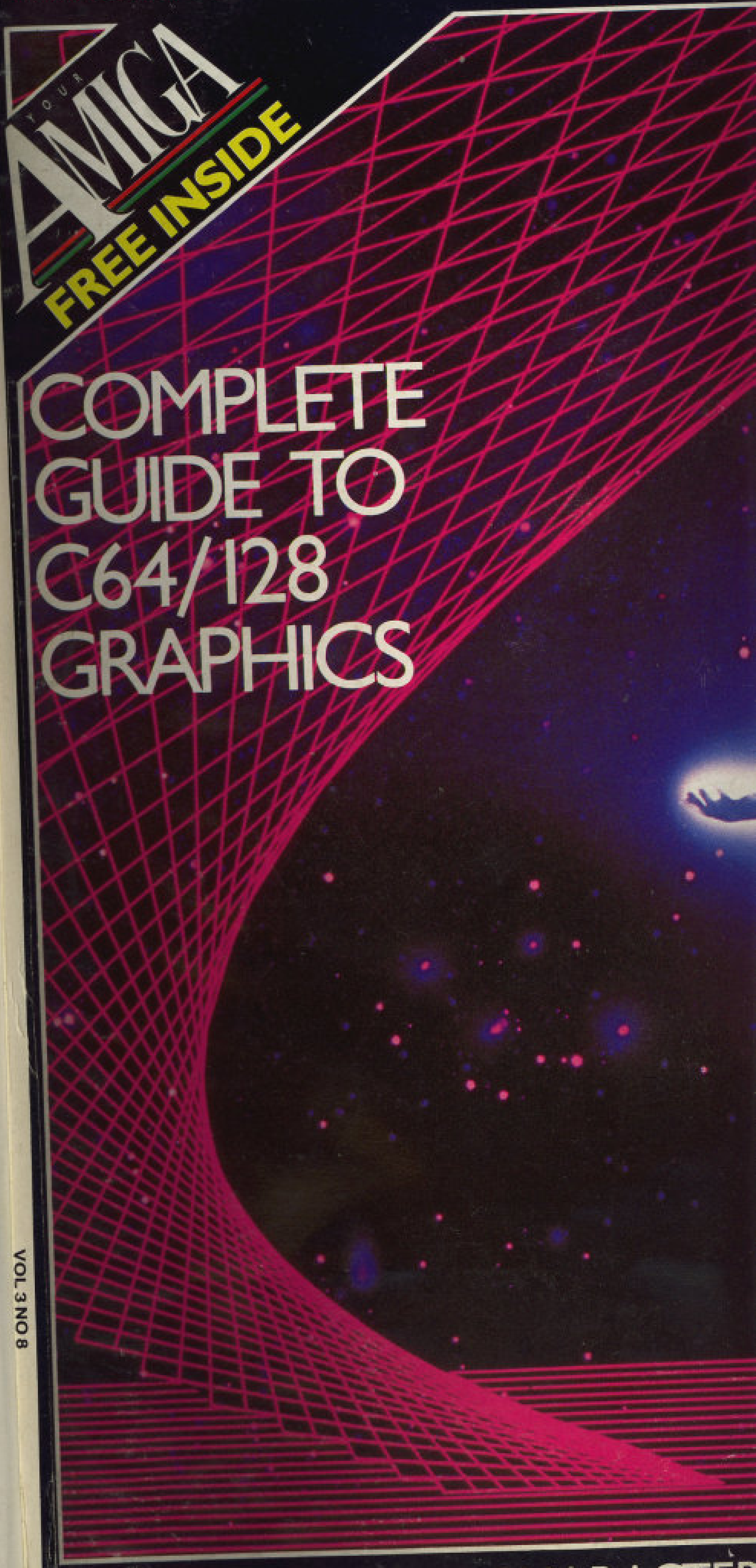
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